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Proceedings of the Seventh Spike Conference held at the Indian Institute of Science, Bangalore, on Monday, the 25th April, 1932, at 10 a.m.—*Indian Forester*, lviii, 9, pp. 489–495, 1932.

A summary of the definite results obtained during the last five years in connexion with the study of spike disease of sandal [*Santalum album*: *R.A.M.*, xi, p. 336] was given by the chairman of the Conference, Dr. H. E. Watson, of the Indian Institute of Science, Bangalore.

The best results in the transmission of the disease have been obtained by the insertion of diseased leaf tissues [ibid., x, p. 69], while attempts to graft on the roots have so far been unsuccessful. Evidently, therefore, infection is conveyed by means of aerial agencies and not through the root system.

A method of leaf measurement facilitating the early recognition of the disease has been devised.

Certain varieties or strains of sandal possess an inherent resistance to spike, but no definite mode of identifying them has yet been evolved. Profuse root development and a strong tendency to haustorial formation appear to be typical of such varieties. *Lantana* [*camara*] has been suggested as a cause of spike. This does not seem to be actually the case, but it is an unfavourable host and likely to induce conditions adverse to healthy growth.

Lopping or ringing the affected part of a tree is sometimes useful in checking further extension, but this method of control is uncertain owing to the occasional occurrence of the disease in a latent form. In the destruction of infected trees a patent preparation known as Atlas, containing sodium arsenite, has given the best results.

A type of chlorosis has been induced in healthy sandal trees by means of certain Curculionidae fed on spiked material, but further experiments are necessary to establish a connexion between the two disorders.

McCULLOCH (LUCIA) & DEMAREE (J. B.). **A bacterial disease of the Tung-Oil tree.**—*Journ. Agric. Res.*, xlv, 6, pp. 339–346, 3 figs., 1932.

This is a brief account, based chiefly on greenhouse experiments in Washington, D.C., of the bacterial disease of tung-oil trees (*Aleurites fordii*) recently described from southern Georgia by

Boyd [*R.A.M.*, x, p. 140]. Isolations from infected leaves yielded a bacterium which, in some of its characteristics, is very similar to certain known pathogens of beans (*Phaseolus* spp.), and the pathogenicity of which to tung-oil trees was proved by successful inoculations of the leaves both in the greenhouse and in the field. No infections, however, were secured on the petioles or stems. The organism is a short (1·1 to 3 by 0·6 to 0·7 μ), motile, capsulate, non-sporiferous, aerobic, gram-negative, non-acid-fast rod, with 1 to 5 polar (rarely bipolar) flagella. On beef agar it forms circular to slightly lobed, white, translucent colonies, becoming greenish-white and transparent. It clouds beef bouillon and forms a pellicle, does not liquefy gelatine, does not clear or liquefy blood serum, and produces a green fluorescence in all beef media; it has a moderate diastatic action, produces readily acid without gas from dextrose, galactose, glycerine, and mannite, and slowly from saccharose, lactose, and maltose; it reduces nitrates, produces indol, ammonia, and hydrogen sulphide in small amounts, and slightly reduces litmus in milk. It grows best at P_H 6·2 to 6·8, remains fully viable in herbarium specimens and in the leaves in the orchard for at least four months, and its optimum temperature for growth is 27° to 28°, with a maximum at 37° C. The organism is considered to be undescribed and is named *Bacterium aleuritidis* n.sp.

Inoculation experiments showed that *Bact. aleuritidis* is also slightly pathogenic to the castor bean (*Ricinus communis*), and causes severe infections on several varieties of French beans (*Phaseolus vulgaris*). On the leaves of the tung-oil tree, the bacteria enter through the stomata, and infection was most active when the plants were kept in a moist atmosphere for 24 to 48 hours. It is believed that the bacteria probably overwinter in the lesions on fallen leaves.

Ritchie (J. H.). **Some observations on the honey agaric (Armillaria mellea syn. Agaricus melleus).**—*Scottish Forestry Journ.*, xlvi, 2, pp. 132–142, 2 figs., 1932.

A study has been made of the distribution and pathogenicity of the honey fungus (*Armillaria mellea*) [*R.A.M.*, xi, p. 681] in three areas in the north-east of Scotland, viz., Pitfour and Fyvie (Aberdeenshire) and Durris (Kincardineshire).

At Pitfour the disease has broken out in a plantation consisting mainly of Norway spruce (*Picea excelsa*) and Scots pine (*Pinus sylvestris*), of which the latter was much the more susceptible, 22 per cent. of the stand being destroyed; only one case was observed on the spruce and here infection was secondary to injuries inflicted by deer. Most of the mortality occurred in a part of the plantation where the ground vegetation is composed largely of *Deschampsia caespitosa* with occasional clumps of male fern (*Lastraea filix-mas*), and there is a stony layer near the surface just below the raw humus. In some cases the rhizomorphs are able to penetrate the stem bark under cover of the leaf litter, and in one instance of a Scots pine killed by the fungus they were found boring right through to the phloem. The rhizomorphs, moreover, always extruded their tips to any forking into two roots where the

bark was usually wrinkled. Below the Norway spruce trees the soil is kept drier by the dense foliage than under the pine, and the rhizomorphs are correspondingly less vigorous. Stumps saturated throughout with water always show a much greater number of rhizomorphs than dry ones. The only feasible method of control is trenching round the infected area.

At Durris the fungus has infected a plantation of twenty-five-year-old silver firs (*Abies nobilis*), the mode of attack being similar to that already described. The soil in this plantation is a fine loam with an upper layer of raw humus and there is a considerable amount of moisture.

At Fyvie the disease is reported to have been present for at least thirty years on an eighty-year-old pure plantation of Scots pine. The affected site is at the top of a hill, so that bad drainage cannot be a factor here, but the ground is very stony. For at least fifteen years some trees have been killed annually by the disease and cut out, leaving a bare area 1½ to 2 acres in extent, the total number of deaths in this area being roughly estimated at 80 to 90 per cent. An attempt was made a few years ago to keep the fungus within bounds by means of a surrounding trench, but this was only partially successful owing to subsequent filling up which enabled the rhizomorphs to cross it. Infection now appears, however, to be dying out naturally in this area, since no trees were killed in 1931 and very few rhizomorphs could be found in the soil.

In the Scots pine the rhizomorphs enter through cracks in the successive cortical layers until the soft inner bark is reached. In the spruce and silver fir the bark does not crack, but that of the latter is much softer and less compact than in the spruce and also tends to run into folds at the collar which are easily penetrated.

Dodge (B. O.). **Notes on three Hemlock fungi.**—*Mycologia*, xxiv, 5, pp. 421–430, 2 pl., 1 fig., 1932.

The examination at the end of 1931 of the branches of a few small hemlock trees (*Tsuga canadensis*), showing signs of a fungal blight, at Scarsdale, N.Y., revealed three species of fungi, the most conspicuous among which was identified as *Cenangium balsameum* Peck, which is stated to have been transferred by Seaver (in an unpublished monograph of *Dermatea*) to the latter genus under the name *D. balsamea* n. comb. On corn meal agar the fungus (grown from single ascospores) produced micropycnidia, the spores in which somewhat resembled the stylospores of a *Phomopsis*. Later well-organized pycnidia were formed, it is believed probably directly from the micropycnidia, and contained septate, slender, flexuose, slightly twisted or sigmoid macroconidia. This conidial stage, which was also present on the hemlock branches in nature, agrees well with Peck's description of *Gelatinosporium abietinum*, and is essentially a *Micropera* as indicated by von Höhnel.

The second fungus was a species of *Myxosporium*, the identity of which was not established, as its ascogenous stage was not found. It does not appear to be related to *G. abietinum*, but is probably connected with some other species of *Dermatea*, possibly *D. livida* [*R.A.M.*, x, p. 633].

The third species, found on the branches as a secondary parasite,

was identified as *Phomopsis occulta*, the conidial stage of *Diaporthe conorum* [ibid., x, p. 278].

Investigations are in progress to determine the pathogenicity of the three species to hemlock.

GREGOR (MARY J. F.). **The possible utilisation of disease as a factor in Bracken control.**—*Scottish Forestry Journ.*, xlvi, 1, pp. 52–59, 3 figs., 1932.

Bracken [*Pteridium aquilinum*] in the west of Scotland is liable to a severe die-back disease associated with an undetermined species of *Mycosphaerella* [*R.A.M.*, xi, p. 215], which may possibly prove to be of value in the eradication of the fern under average environmental conditions. A second disease, occurring in the west of Scotland and north-eastern Ireland exclusively in very damp situations, is also highly destructive within its more limited scope, killing the fronds and spreading for a short distance down the leaf stalks. The dead leaf segments shrivel and fall off, so that in severe cases little is left but the bare axis of the frond covered with the felt-like mycelium of the fungus. Spherical or oval sclerotia, up to a quarter of an inch in diameter, with a dark brown outer wall, are formed on the dead areas and probably serve to carry the organism (a species of *Corticium*) [see next abstract] through the winter.

GREGOR (MARY J. F.). **Observations on the structure and identity of Tulasnella anceps Bres. et Syd.**—*Ann. Mycol.*, xxx, 5–6, pp. 463–465, 1932. [German summary.]

In connexion with a study of the bracken (*Pteridium aquilinum*) disease caused by a sclerotial fungus in Scotland [see preceding abstract], the writer has examined material of *Tulasnella anceps* Bres. & Syd. (*Ann. Mycol.*, viii, p. 489, 1910) in comparison with *Corticium vagum* and *C. solani*, to the former of which it had been referred by Bourdot and Galzin. While its transfer to the genus *Corticium* is accepted, the author considers it to be distinct from the two species mentioned, which are apparently identical or very closely related to one another. The bracken fungus in Scotland is referred to *C. anceps* (Bres. & Syd.) Gregor n. comb. The sclerotia found on bracken in nature have also been formed in cultures of *C. anceps* on 5 per cent. malt extract agar and do not appear to have been observed by the previous investigators. They are highly resistant, being able to withstand ten minutes' immersion in 1 in 1,000 mercuric chloride. The white mycelium of *C. anceps* exhibits zonation in culture, and has not formed basidia or spores on any of the media tested.

GÄUMANN (E.). **Der Einfluss der Fällungszeit auf die Dauerhaftigkeit des Fichten- und Tannenholzes.** [The influence of the time of felling on the durability of Fir and Spruce wood.] —*Angew. Bot.*, xiv, 5, pp. 387–411, 3 figs., 10 graphs, 1932.

This is a condensed account of the author's laboratory and field studies in Switzerland on the influence of the date of felling on the durability of fir and spruce wood, as gauged chiefly by its resistance to parasitic fungi [*R.A.M.*, x, p. 146].

Analytische Methoden zur Bestimmung von Quecksilber, Zink, Fluor, und Arsen in imprägnierten Hölzern. [Analytical methods for the determination of mercury, zinc, fluorine, and arsenic in impregnated woods.]—*Chem. Zeit.*, lvi, 74, pp. 730–731, 1932.

Full details are given of the analytical methods in use at the Rütgers Wood Preservative Laboratory, Berlin, for the estimation of mercuric chloride, zinc chloride, the water-soluble fluorides, and arsenical compounds in impregnated timber [cf. *R.A.M.*, xi, p. 15].

The method of mercury analysis consists in the boiling of the wood in hydrochloric acid with the addition of sodium chlorate, reduction of the lixiviated sublimate with stannous chloride, followed by the titrimetric determination of the filtered-off mercury dissolved in nitric acid.

The estimation of zinc chloride necessitates the fragmentation of the wood, which is then charred in a porcelain crucible; hydrochloric acid is poured over the residue, the resultant solution boiled, made alkaline with dilute ammonia, and filtered off. The filtrate is reacidified with hydrochloric acid and the zinc determined by one of the usual methods.

The estimation of the fluorides is based on the following principle. The fluorine salt is converted into insoluble, thermostable calcium fluoride by the saturation of the wood in a lime salt solution. The wood is then reduced to ashes, which are freed from calcium carbonate by treatment with dilute acetic acid, and dissolved by Penfield's method in sulphuric and silicic acid; the resultant SiF_4 is then titrated with sodium lye.

Arsenic in the form of arsenic trichloride is distilled from the treated wood after the addition of fuming hydrochloric acid, and the arsenic in the distillate titrated.

WELLMAN (F. L.). **Rhizoctonia bottom rot and head rot of Cabbage.**—*Journ. Agric. Res.*, xlv, 8, pp. 461–469, 3 figs., 1932.

As a result of his investigations in the cabbage-growing districts of the United States from 1923 to 1928, inclusive, of the incidence and prevalence of head rot and bottom rot of cabbage caused by *Corticium vagum* [*C. solani*: *R.A.M.*, vi, p. 590; x, p. 421], the author states that the bottom rot occurs every year, while the head rot develops only at times in the field, under conditions that have not yet been exactly defined. Isolations and inoculation experiments have shown that both diseases [a brief description of which is given] of the older plants are caused by the same strain of the fungus that produces damping-off or wire stem [loc. cit.] of cabbage seedlings. Cross-inoculation experiments with strains of *C. solani* isolated from cabbage, beans, beet, peas, potato, and lettuce showed that the strains from the other hosts did not cause head or bottom rot of cabbage, though the lettuce strain caused cabbage seedlings to damp-off. All the strains appeared to be most active on the hosts from which they were originally isolated.

Experiments under controlled conditions showed that a relatively large amount of moisture is necessary for the optimum development of both head rot and bottom rot; both developed

at temperatures ranging from 9° to about 32° C., with an optimum between 25° and 27°.

COTTIER (W.). **Insect transmission of dry-rot (Phoma lingam) of Swedes.**—*New Zealand Journ. of Agric.*, xlv, 4, pp. 219–224, 2 figs., 1932.

The results of continued experiments [details of which are given] on the transmission by insects of dry rot (*Phoma lingam*) of swedes [*R.A.M.*, x, p. 151] definitely showed that, as indicated in the earlier work, the disease is distributed by insect vectors, among which the Staphylinid beetle *Atheta pseudocoriaria* and the Drosophilid fly *Drosophila rubrostriata* appear to be the most active and efficient carriers. In the experiments more disease was transmitted by *D. rubrostriata* than by *A. pseudocoriaria*, presumably owing to the fact that the former usually flies from one host to the next, while the beetle keeps by preference to its legs. There also was evidence that surface injured swede roots were more readily infected than perfectly sound ones.

CHENEY (GWENDOLYN M.). **Pythium root rot of Broad Beans in Victoria.**—*Australian Journ. Exper. Biol. & Med. Sci.*, x, 3, pp. 143–155, 6 figs., 1932.

Broad beans (*Vicia faba*) in the Melbourne district have been severely affected of recent years by a disease involving decay of the roots and stunting or collapse of the plants. In advanced cases nothing remains of the root system but a shrivelled vascular cylinder. As a rule no symptoms are observed on the stems and leaves until the plant is at least 8 in. high, and usually not before the formation of flower buds at a height of 2 to 3 ft.; then the tips of the shoots become flaccid and bend over, while the leaves curl in from their edges. The lower leaves wilt and turn black, and at the same time dark streaks appear on the stem base, which subsequently turns black and assumes a waterlogged aspect. The flowers may die and fall off, or they may form pods, but the latter remain stunted and generally wither. In sandy soils the symptoms appear much earlier, when the plants are a few inches high. The leaves are upcurled, small, narrow, and crowded, and the plants remain stunted, fail to set seed, and are eventually killed.

A *Pythium* was readily isolated from diseased material and grown on various media. In culture it is characterized by irregularly septate, granular, hyaline hyphae, 4 to 10 μ in diameter (average 7·5 μ), rounded at the ends; sparse terminal or intercalary, spherical to subspherical conidia, 13 to 26 μ (average 21·5 μ) in diameter, germinating directly by one or more germ-tubes; smooth, spherical or occasionally irregular, terminal or intercalary oogonia, 13 to 23 μ (average 19·7 μ) in diameter; single or double antheridia arising from the oogonial stalk at some distance from the oogonium, or from a branch, arched, narrow (only slightly exceeding the diameter of the stalk); spherical, smooth-walled oospores, usually not filling the oogonium, 11·5 to 17·5 μ (average 15·7 μ) in diameter, not observed to germinate. The species differs from *P. ultimum* [*R.A.M.*, xi, pp. 344, 408], to which it is most

closely related, in its antheridial and conidial characters. It is named *P. fabae* n. sp., with an English diagnosis.

The mycelium was found in abundance in the cortex (where the hyphae are mainly intercellular) and in the vascular cylinder, causing disintegration. Oospores were also found in the cortex and in the roots. Inoculation experiments on pot plants resulted in rotting of the roots after three weeks, followed three weeks later by the development of external symptoms.

V. A. Wager is stated to have isolated a species of *Pythium* in South Africa apparently identical with that on the broad bean, but there seem to be no other records of a disease of this host caused by *Pythium*. The inoculation tests of Sideris have shown, however, that *V. faba* is susceptible to most species of the genus [ibid., x, p. 555].

P. (L.). **Considérations sur les maladies de la Betterave ainsi que sur les maladies parasitaires des plantes en général.** [Reflections on Beet diseases and on the parasitic diseases of plants in general.]—*Bull. Assoc. Chim. Sucr., Dist. & Indus. Agric. de France*, xlix, 5, pp. 197–199; 6, pp. 232–235, 1932.

In connexion with a mainly theoretical dissertation on the nature of disease in the beet and other plants, the writer mentions the beneficial effects of lime and magnesia on the course of dry rot [*R.A.M.*, xii, p. 2]. These observations were exemplified by an experiment in which young beets affected by the disease in a clay soil poor in both the above-mentioned elements recovered completely on transference to a soil containing both in abundance.

Miestinger (K.), Fischer (R.), Watzl (O.), & Porsch (L.).— **Wichtige Schädlinge und Krankheiten der Rübe in Österreich.** [Important pests and diseases of the Beet in Austria.] —*Bauernschr.* 37 (Niederösterr. Landes-Landwirtschaftskammer), 28 pp., 15 figs., 1932.

Popular notes are given on the symptoms and control of the following diseases affecting beets in Austria; root rot [*Pythium de Baryanum, Phoma betae*, and to a lesser extent *Aphanomyces levis* and *Pythium aphanidermatum*: *R.A.M.*, x, p. 768], heart and dry rot [see preceding abstract], leaf spots (*Cercospora beticola* and *Ramularia betae*) [ibid., ix, p. 757], mildew (*Peronospora schachtii*), rust (*Uromyces betae*), red rot (*Rhizoctonia violacea*) [*Helicobasidium purpureum*] [ibid., x, p. 701], a bacterial rot of the 'tail' or tap root, and various types of scab of combined bacterial and fungal origin.

Du Plessis (S. J.). **Parasitisme, morphologie en physiologie van Fusarium solani (Mart.) Sacc. op Uie.** [Parasitism, morphology, and physiology of *Fusarium solani* (Mart.) Sacc. on Onion.]—*Ann. Univ. Stellenbosch.*, Ser. A, x, 2, 17 pp., 3 figs., 1 graph, 1932. [English summary.]

Fusarium solani [*R.A.M.*, xi, pp. 67, 226] was isolated from onion bulbs at Stellenbosch, Cape Province, simultaneously infected by *F. cepae* and *Sclerotium cepivorum* [ibid., x, p. 429; xi, p. 219]. Inoculation experiments with the first-named fungus through the

seed, soil, and growing bulbs gave negative results, but when harvested bulbs of the Early Cape variety were inoculated and kept for 48 hours in a saturated atmosphere, they developed a dry rot ending in complete mummification in a month. *F. solani*, therefore, may be regarded as a weak parasite capable of infecting onion bulbs from which the toxic substance in the scales repelling fungous pathogens [ibid., iv, p. 519] disappears on the cessation of growth. A high degree of humidity is a necessary condition for infection. The same fungus caused a watery rot of healthy potato tubers under favourable conditions in the laboratory.

Details are given of the morphology of *F. solani*, including a table of the conidial dimensions on various standard media. The average sizes are as follows: 1-cellular, 3·3 to 18·3 by 1·3 to 5·3 μ (average 8·4 by 3·3 μ); 2-cellular, 6·7 to 28·3 by 2 to 6·7 μ (15·8 by 3·7 μ); 3-cellular, 11·7 to 36·7 by 3 to 6·7 μ (22·1 by 3·8 μ); 4-cellular, 18 to 40 by 3 to 6·7 μ (30·7 by 3·8 μ); 5-cellular, 28·3 to 41·7 by 3·3 to 5·7 μ (34·5 by 4·3 μ); and 6-cellular, 23·3 to 45 by 3·3 to 6·7 μ (33·2 by 3·7 μ). The best growth was made at an alkaline reaction ($-10°$ Fuller's scale), though development occurred also at $-30°$ and $+10°$, and the optimum temperature was found to lie between 27·5° and 28·5° C.

This is believed to be the first record of *F. solani* as an agent of storage rot of onions.

WELLMAN (F. L.). **Celery mosaic control in Florida by eradication of the wild host Commelina nudiflora.**—*Science*, N.S., lxxvi, 1974, pp. 390–391, 1932.

Recent investigations on the control of celery mosaic in the Sanford district of Florida have shown that the disease may be greatly reduced by the eradication of the only important wild host, *Commelina nudiflora* [*R.A.M.*, x, p. 429]. The only insect found to carry the disease is *Aphis gossypii*, but infection is readily conveyed from plant to plant by mechanical means. The virus persists from season to season in the growing plants of *C. nudiflora*.

KUNKEL (L. O.). **Celery yellows of California not identical with the Aster yellows of New York.**—*Contrib. Boyce Thompson Inst.*, iv, 3, pp. 405-414, 2 figs., 1932.

Yellowed specimens of aster, celery, and carrot were sent to the writer by Severin from California [*R.A.M.*, x, p. 286] and used in comparative transmission tests with the New York aster yellows [ibid., x, p. 734].

The Californian yellows was readily transmitted from aster to Silver and Golden Self Blanching and White Plume celery plants by colonies of *Cicadula sexnotata*, whereas the New York aster yellows was not similarly transmissible to celery. The Californian disease was transferred from an experimentally infected Silver Self Blanching celery plant to asters of the Semple's Late Flowering variety. Transmission of Californian yellows was further effected from carrot to aster. On asters the symptoms of the two diseases were quite similar. In two tests of the length of time required for the incubation of the Californian yellows virus in the vector, periods of 17 and 18 days, respectively, were shown, while

in six other experiments 19 to 26 days elapsed between infection and the development of the symptoms. These results agree in the main with those obtained in similar tests with the aster yellows of New York. In respect of transmission to celery, however, the Californian yellows differs from the New York aster yellows.

SPRAGUE (R.). **Notes on Phyllosticta rabiei on Chick Pea, II.**—*Phytopath.*, xxii, 9, pp. 786–787, 1932.

The author does not approve of Labrousse's proposal to transfer the causal organism of chick pea anthracnose from *Phyllosticta* to *Ascochyta* as *A. rabiei* (Pass.) nov. comb. [*R.A.M.*, xii, p. 75] on account of its sometimes septate conidia and occurrence on organs other than leaves. Though technically justifiable, a rigid adherence to these as generic characters would cause much confusion in several analogous cases, which are briefly discussed. The writer cannot follow Labrousse in considering *A. pinodella* L. K. Jones as a parallel case to *P. rabiei*, since collections of the former show septation in nearly 100 per cent. of the spores, whereas in the latter 96 to 98 per cent. are non-septate. The retention of the combination *P. rabiei* (Pass.) Trotter is, therefore, advocated.

GHESQUIÈRE (J.). **Sur la 'mycosphaerellose' des feuilles du Manioc.** [On 'mycosphaerellosis' of Cassava leaves.]—*Bull. Inst. Roy. Colon. Belge*, iii, 1, pp. 160–178, 1932.

The author states that *Mycosphaerella manihotis* Ghesq. et Henr. described by him and Henrard on cassava in the Belgian Congo in 1924 [*R.A.M.*, v, p. 530] appears to be a synonym of *M. manihotis* Syd. described in 1901 on cassava in the Argentine; the slight differences in the description being attributable to the state of maturity of the fungus, or to ecological reactions. *Lizonia manihotis* Zimm. is also considered to be the same organism. The imperfect stage of *M. manihotis* is a *Cercospora*, referred to *C. cassavae*, which develops on the same dark brown mycelial stroma as that in which the perithecia form. A list is given of the species of *Cercospora* hitherto found on the same host, *Cercosporella* forms being included [cf. ibid., v, p. 144; xi, p. 130]. The paper terminates with a brief review of the geographical distribution of the disease caused by *Cercospora cassavae*, a note on control methods, and a three-page bibliography. In a footnote on p. 172 it is stated that the insect vector of the common mosaic disease of cassava [ibid., xi, p. 761] has been found by the writer and Kufferath to be an Aleurodid, *Bemisia mosaicivecta* n. sp., to be described shortly in the *Rev. Zool. Bot. Afr.* of Brussels.

WAKSMAN (S. A.) & NISSEN (W.). **On the nutrition of the cultivated Mushroom, Agaricus campestris, and the chemical changes brought about by this organism in the manure compost.**—*Amer. Journ. of Botany*, xix, 6, pp. 514–537, 5 graphs, 1932.

Further studies have been carried out in New Jersey on the chemical composition of horse manure composts prepared for the growth of the cultivated mushroom (*Agaricus* [*Psalliota*] *campestris*) [*R.A.M.*, xi, p. 3].

In comparative tests of mushroom growth on two types of manure, with and without bedding, and with and without additional straw, the best results were obtained from manure with bedding and 25 per cent. wheat straw, as well as the requisite amounts of nitrogen and mineral nutrients.

The process of manure composting is accompanied by a rapid development of fungi and bacteria, which cause a reduction in the water-soluble substances of the manure, in the hemicelluloses, and to a slighter extent in the cellulose, with a corresponding relative increase in the lignin and total nitrogen contents and the ash.

P. campestris does not use the compost as a whole for its very considerable nutritional and energy requirements, but attacks by preference the lignins and the organic nitrogenous complexes, and to a lesser extent the hemicelluloses and the cellulose. In the course of its growth the lignins are markedly reduced, both in absolute quantity and relatively to the other organic complexes, the nitrogenous substances being at the same time transformed from an insoluble organic into soluble organic and mineralized (NH_3) forms. The high content of water-soluble nitrogen is due to the fact that nitrogen constitutes 6·44 per cent. of the dry weight of the mycelium, with nearly half the quantity in a water-soluble form.

The bulk of the compost left after the growth of the mushroom consists of the mycelium and products of decomposition of the fungus.

SERVIÈRE (H.). **Réflexions sur le mildiou.** [Reflections on mildew.]—*Prog. Agric. et Vitic.*, xcviii, 37, pp. 258–260, 1932.

The severity of the vine mildew (*Plasmopara viticola*) outbreak in France in 1932 [*R.A.M.*, xii, p. 72], which at the beginning of September showed signs of causing at least as heavy financial losses as in 1930 [ibid., x, p. 580], leads the author to point out that the first, early spring invasion of the fungus may be to a great extent checked, if not completely suppressed, by the destruction of the oospores which overwinter in or on the soil in the vineyards. To be effective as a source of infection, the oospores must be washed into close proximity to the vine stocks, since their zoospores cannot be carried by wind to long distances without losing viability. This indicates the advisability of removing all adventitious growth that develops at the base of the stocks in the spring, since this is highly susceptible to the fungus; it could be destroyed by spraying with a copper sulphate solution of a concentration sufficient to kill it, while still being uninjurious to the wood.

CORNU (C.). **Bouillies de cuivre mouillantes et adhérentes.** [Wetting and adhesive copper spray mixtures.]—*Prog. Agric. et Vitic.*, xcviii, 38, pp. 279–284, 1932.

After stating that the protective efficacy against vine mildew [*Plasmopara viticola*] of an otherwise chemically good cupric spray depends chiefly on its wetting and adhesive properties, the author suggests a rule-of-thumb method for the rapid evaluation of these properties, for the guidance of vine-growers in the choice

of ready-made commercial products. The evaluation of the wetting property is based on the fact that a liquid is more wetting as its surface tension decreases, and that liquids with a low surface tension, when issuing from a dropper (stalagmometer) of a given calibre, give more drops for the same volume than liquids with a high surface tension [cf. *R.A.M.*, xi, p. 153].

The adhesiveness of the spray mixtures may be roughly estimated by depositing drops from a standard volume of the liquid tested on a standard piece of waterproof paper which, after spontaneous drying, is fixed to a wood strip and then washed by repeated dipping in water (preferably rain water, the content of which in carbon dioxide may be artificially increased). The piece of paper is then incinerated and the content of the ash residue in copper is evaluated by the usual method; the more adhesive liquids will obviously give a higher copper residue after washing than the less adhesive.

Touze (A.). **Résultats d'essais de traitement à l'alun.** [Results of control experiments with alum.]—*Prog. Agric. et Vitic.*, xcviii, 42, pp. 368–369, 1932.

Following a communication of an observation that alum sprays appeared to have a curative effect on vine mildew [*Plasmopara viticola*], the author made in August, 1932, a small range of experiments, in which he used a 4 per cent. solution of alum to spray grape bunches showing various degrees of intensity of attack by the fungus. The results [shown in a table] failed to reveal any controlling effect of the alum spray on the development of the mildew.

Reports on the work of Agricultural Research Institutes and on certain other agricultural investigations in the United Kingdom. 1930–1931.—377 pp., London, H.M. Stationery Office, 1932.

The following are among the items of phytopathological interest, not already noticed from other sources, in this report, which is prepared on the same lines as that of the preceding year [*R.A.M.*, x, p. 583].

Investigations (under the auspices of the Scottish Society for Research in Plant Breeding) at the North of Scotland sub-station, Gibston, Huntly, Aberdeenshire, are in progress on potato mosaic. In a series of grafts and inoculations between potato varieties and seven species of Solanaceae, *Hyoscyamus niger* was found to be of value in differentiating between mosaics [ibid., xi, p. 735], and also in determining the presence of the mosaic and necrotic viruses latent in apparently healthy plants [cf. ibid., xii, p. 48].

A strawberry wilt responsible for considerable losses at the Horticultural Research Station, Cambridge University, as well as in the King's Lynn district of Norfolk, appears to be due to a species of *Verticillium* [cf. ibid., xi, p. 727], experimental work on which is in progress.

In continued studies on bracken [*Pteridium aquilinum*] diseases [ibid., viii, p. 412] attempts were made at the West of Scotland Agricultural College to spread infection in the field by

transplanting blocks of bracken a yard or more square from diseased to healthy sites, but so far seven out of eight transplants have given negative results, while the outcome of the remaining test was inconclusive.

At the University College of Wales, Aberystwyth, fairly good control of onion mildew [*Peronospora schleideni*: ibid., xi, p. 689] was given by a new resin-sulphur spray with superior adhesive properties. Onion varieties showing marked resistance to white rot (*Sclerotium cepivorum*) have been developed as a result of several years' tests at Manchester University [ibid., ix, p. 356], and breeding work is in progress at the Horticultural Research Station, Cambridge, to combine this character with desirable market qualities.

The severity of apple mildew (*Podosphaera leucotricha*) [ibid., x, pp. 159, 465] was found by experiments at Manchester to be greatly minimized by a dressing of sulphate of potash at the rate of 3 cwt. per acre.

Observations and experiments at Reading University have confirmed the view that dry rot and canker of swedes [*Phoma lingam*] may be present at every stage from the sowing of the seed to the storing of the roots or the harvesting of the seed crop [ibid., xi, p. 489]. Notwithstanding the damp summer, no infected seed crop was observed where the amount of disease in the seed was likely to exceed a maximum of 1 to 2 per cent. Further evidence has been obtained of the extensive transmission of the fungus on *Brassica alba*, occurring as a weed in swede fields [ibid., x, p. 584]. Good control of *P. lingam* on swedes grown from badly infected seed was given by Du Pont granosan (the name under which the American Du Bay ceresan is sold in England) and the European ceresan dusts.

Phytophthora cryptogea var. *richardiae* [ibid., ix, pp. 272, 594] has been shown at Reading to be the cause of a tulip disease of which 'shanking' is only one phase, the fungus being also responsible for root rot and complete decay of the flowering shoot.

Rothamsted Experimental Station Report for 1931.—199 pp., 1 fig., 1 diag., 1 graph, 1932.

This report contains the following items of phytopathological interest. J. Singh found that the types of soil fungi occurring in differently manured plots were much the same, but the numbers were consistently higher on the more fertile plots. No evidence was obtained of seasonal fluctuations in numbers [*R.A.M.*, viii, p. 126].

J. Henderson Smith and his assistants found that the juices extracted from plants affected by virus diseases contain particles, the size of which has been estimated [ibid., xi, p. 735], but it is uncertain whether the virus itself is particulate or merely attached to other particles. In a case in which specific bacteria are regularly associated with the symptoms of a virus disease, the inoculation of plants grown under aseptic conditions with bacterium-free virus was found to produce the typical disease, while the organisms usually connected with it did not develop. The virus was never found to enter an unbroken cell. Large quantities of virulent

juice may be injected into the leaf of a plant through the stomata, but unless some of the cells are ruptured no symptoms will develop [ibid., xi, p. 754].

The causal organism of blackarm and angular leaf spot of cotton (*Bacterium malvacearum*) has been shown by R. H. Stoughton to dissociate into a number of culturally distinct strains with varying degrees of virulence [ibid., xi, p. 772]. Strongly virulent strains may give rise to almost non-virulent ones, which in their turn may revert to the culturally divergent virulent form. Air temperature plays the chief part in the development, as apart from the spread, of the disease [ibid., xi, p. 297]. In the control chambers, severe secondary infection of the growing plant with a virulent culture is only obtained by spraying at temperatures above 30° C. Soil temperature is less important, though it plays some part in determining the amount of disease on the very young seedlings grown from infected seed, this being less at temperatures above 30°. Air humidity is the principal factor in allowing secondary spread of the disease. Internal infection of cotton seed was found to be very rare, most cases of primary infection arising from external contamination.

W. B. Brierley found that two or more races of *Botrytis cinerea* were obtainable from a single lesion in most cases of spontaneous infection by this fungus [ibid., xi, p. 477]. No evidence was forthcoming in numerous experiments, designed to study the educability of individual races, that changes could be produced extending beyond one generation.

No correlation was found by L. M. J. Kramer in his observations at Rothamsted and Woburn between manurial treatment and severity of infection by late blight of potatoes (*Phytophthora infestans*). Pot culture experiments indicated, however, that the excessive use of phosphatic fertilizers increases tuber infection by pink rot (*P. erythroseptica*) [ibid., ix, pp. 136, 203, 225, 809].

Notes are given by Miss M. D. Glynne on the fungous diseases of crops on the Rothamsted and Woburn experimental plots during the period under review.

SAMUEL (G.). **Summary of plant disease records in South Australia for the two years ending June 30th, 1932.**— *Journ. Dept. Agric. S. Australia*, xxxvi, 3, 300-301, 1932.

This summary of plant disease records made in South Australia during the two years ending June 30, 1932, contains the following items of special interest.

In 1931 the red grass-destroying fungus *Isaria graminiperda* was reported for the first time from various localities in northern and south-eastern parts of the State, principally as causing small patches of infection on *Poa bulbosa*.

Diseases of citrus included brown rot (*Phytophthora hibernalis*) [*R.A.M.*, xi, p. 222], which caused heavy losses in non-irrigated areas, especially the Inman valley, and bacterial spot (*Bacterium citriputeale*), which was more prevalent than usual. Two new records on citrus were a stem-end rot caused by a *Phomopsis* closely agreeing with *P. californica* [ibid., ix, p. 766; x, p. 98], reported once from the Coromandel valley, and a black, leathery

rot with reddish margins due to a *Pleospora* closely agreeing with *P. herbarum* [ibid., xi, p. 449]. *Armillaria mellea* was found on oranges after the digging in of chips from the wood heap, and crinkle (cracking of the rind pith under the surface) was occasionally reported from the drier areas.

Stereum purpureum is becoming more prevalent in the Adelaide hills, where it causes silver leaf of plums, apricots, and apples; it was also present in Kangaroo Island.

Bacterial blight of French beans (*Phytomonas* [*Bact.*] *medicaginis* var. *phaseolicola*) [ibid., xi, pp. 418, 687, 759] caused considerable losses in 1931 and 1932. *A. mellea* severely damaged a bed of parsnips and carrots at Kingston. Neck rot (*Botrytis allii*) and smudge (*Colletotrichum circinans*) of onions were recorded for the first time, as was a *Fusarium* wilt of watermelons.

The tomato spotted wilt virus [ibid., xi, p. 609; xii, p. 59], usually found only on sparsely scattered tobacco plants, in 1932 destroyed over 30 per cent. of a small tobacco field at Mount Gambier.

In 1931 *Phytophthora infestans* was recorded for the first time on seedling petunias in frames.

Pole Evans (I. B.). **Arable farming and pasture problems.**—*Farming in South Africa*, vii, 80, pp. 341–352, 2 figs., 1932.

The following items of phytopathological interest, other than those already noticed from other sources, occur in this report. A few coffee trees of the Mocha variety in experimental plots have, for the first time, shown signs of leaf disease (*Hemileia vastatrix*), which Mysore and Robusta have hitherto escaped [cf. *R.A.M.*, xi, p. 572, and below, p. 169].

Previous experiments had shown an increase in the severity of bitter pit, one of the heaviest sources of loss in the South African apple industry, with a rise in temperature from 32° to 40° F., but subsequent tests indicated that a minimum of this trouble occurs round about 70° [ibid., xii, p. 103].

Out of 818,705 citrus trees inspected for scaly bark or psorosis [ibid., x, p. 97] in the Eastern Transvaal only 88 were found to be infected, while in the Rustenburg district there were only 5 diseased among 2,381.

Armillaria mellea has been found to cause a serious disease of trees in the Government forest reserves of the Louis Trichardt area, those affected including *Pinus longifolia*, *Cedrela toona* [ibid., viii, p. 202], *C. odorata*, *Grevillea robusta* [ibid., x, p. 275], and *Juniperus procera*. In the forest, fructifications of the fungus were found on decaying stumps of *Parinarium mobola*, which probably acted as a source of infection [ibid., viii, p. 202]. Subsequently the disease was observed on living trees of *Eucalyptus paniculata* in a plantation cleared of *C. toona*.

The Marvel and Stone tomato varieties have shown a high degree of resistance to wilt [*Fusarium lycopersici*].

Beans [*Phaseolus vulgaris*] have suffered considerably from bacterial blight [*Bacterium phaseoli*] and mosaic.

The leaf spot of dahlias due to *Entyloma dahliae* [see below, p. 177], hitherto confined to Natal, has been reported from the Transvaal.

STOREY (H. H.). **Report of the Plant Pathologist.**—*Fourth Ann. Rept. East African Agric. Res. Stat., Amani, 1931-2*, pp. 8–13, 1932.

In addition to items already noticed from other sources, this report contains the following information. A maize disease has been observed in the Amani district closely resembling streak [*R.A.M.*, xi, p. 592] but transmissible by the Fulgorid leafhopper, *Peregrinus maidis*, which cannot transmit streak, while conversely *Cicadulina mbila*, the vector of maize streak, is unable to convey the new virus. Possibly the latter may be identical with that investigated by Stahl in Cuba [causing stripe disease: ibid., vii, p. 160].

Negative results were given by experiments, in co-operation with the Station entomologist (T. W. Kirkpatrick), to transmit leaf curl of tobacco to cotton by the whitefly *Bemisia* sp. [ibid., xii, p. 58]. This tobacco disease appears to be widespread in Africa, the Amani investigations having been commenced as a result of the loss of an entire crop in Zanzibar. The same disease is also reported to occur in the Transvaal. The writer has further been informed in correspondence by J. Ghesquière that a similar tobacco disease in the Belgian Congo is transmissible by whiteflies.

During July and August, 1931, the writer confirmed the identity of the groundnut rosette occurring in Uganda with that previously investigated in South Africa [ibid., vii, p. 486]. Apparently the disease may be largely controlled by the existing native methods of cultivation, important features of which are a heavy broadcast sowing-rate and grass-mulching of the soil after sowing. Negative results were given by experiments at Amani in the transmission of the rosette virus to a number of other Leguminosae.

Administration Report of the Director of Agriculture, Trinidad and Tobago for the year 1931.—61 pp., 1932. [Received December, 1932.]

In 1931 bronze leaf wilt of coco-nuts [*R.A.M.*, xii, p. 90] was present on approximately 400 out of over 1,900 properties in Trinidad. Severe losses were sustained, mostly on heavy soils, but the disease was sometimes absent from these and present on free-draining, light land; it was not observed, however, in the more important areas, where the coastal belts in which the palms are grown consist chiefly of free-draining, sandy soil.

Attempts to produce a lime resistant to wither-tip [*Gloeosporium limetticolum*: ibid., xii, p. 22] were mainly confined to field trials of two 1932 hybrids, of which T1 shows promise.

To control witches' broom of cacao (*Marasmius perniciosus*) [ibid., xi, p. 483] all diseased tissues found on the experimental Marper estate were cut out and burnt every month, the total found being 251,079, or 2,684 per acre, and the total annual cost including supervision 7·23 dollars [= approximately £1 10*s.* at par] per acre. The heaviest incidence was in February, when 97,492 diseased parts were destroyed. Evidence was obtained that a few brooms dried up about 14 days after developing, the majority in 20 to 28 days, and others within 42 days, though two required,

respectively, 55 and 65 days. Brooms sheltered from wind and rain adhered longest, the shortest and longest periods elapsing before dropping being 61 and 660 days, respectively. At least 94 days elapsed before any broom produced sporophores. The maximum mushroom production by one broom before dropping was 215, and they were produced every month, but principally in December to February. It was found that sporophores might develop on the site from which the broom had been removed if excision had not been properly carried out. From the middle of 1928 the disease has spread continuously, usually from infected to adjacent estates; in some cases, however, jumps of 5 to 25 miles occurred. The first infection in an estate is probably always air-borne.

During the year the witchbroom staff (chief supervisor, assistant supervisor, and 25 assistant inspectors) paid 22,736 visits to inspect new properties and to advise on control measures. Under the powers granted by the Plant Protection Ordinance [cf. ibid., viii, p. 160] 385 orders were issued, compulsory measures enforced on 27 estates, and 10 owners prosecuted. By the end of December 1931, some 100,000 acres (half the cacao acreage) on 2,454 properties were infected or suspect. On an average, the number of infected trees is trebled annually, but this increase is much greater in wet areas. Appreciable losses have already been sustained in very wet, low-lying districts. Nitrogenous manuring increased infection; of the fungicides tested, Bordeaux mixture was the most useful.

DUPONT (P. R.). **Entomological and mycological notes.**—*Ann. Rept. Dept. of Agric. Seychelles, for the year 1931*, pp. 10–11, 1932.

The scale insect *Ischnaspis filiformis* continues to cause heavy damage in the Seychelles coco-nut plantations and is not appreciably held in check by its newly established parasite, *Pseudomicrocera* [*henningsii*: *R.A.M.*, x, p. 708]. This fungus, together with *Sphaerostilbe coccidophthora*, was found on *Aulacaspis pentagona*, a parasite of *Hibiscus mutabilis*. *Ganoderma lucidum* [ibid., xii, p. 76] is frequently found in coco-nut plantations where the beetle *Melitomma insulare* is prevalent, the former possibly acting as a forerunner of the latter.

Fifty-fourth Annual Report of the North Carolina Agricultural Experiment Station for the fiscal year ending June 30, 1931. Progress Report for year ending December 1, 1931.—130 pp., 11 figs., (?) 1932. [Received December, 1932.]

Summarizing the work of the Division of Plant Pathology (pp. 67–76), S. G. Lehman furnishes the following among other information.

Satisfactory control of loose smut of oats [*Ustilago avenae*] was given by smuttox [ibid., xi, p. 634], especially when the seed was stored in a tight receptacle for 48 hours after treatment. Ceresan (the active ingredient of which is ethyl mercury chloride) reduced the incidence of infection to below 1 as against 17·6 per cent. in the untreated controls. The planting of 29th October, in which 17·6 per cent. smut occurred, was immediately followed by

rain that kept the soil wet for a week or more, the mean maximum and minimum temperatures for ten days after planting being 55·9° and 38·4° F., respectively. The planting of 24th November, on the other hand, was succeeded by a dry week and the maximum and minimum temperatures were 48·4° and 29·3°, respectively, resulting in under 0·2 per cent. smut.

When tobacco plants were set in soil heavily infested with the mosaic virus so that only the crown was in contact with the earth, not more than 2 out of 38 plants became diseased, while no symptoms appeared when the roots alone were in contact with the soil. Evidently, therefore, the virus does not readily enter the plants through the root system. No infection developed on plants with uninjured roots immersed for 48 hours in the virus, or on those similarly immersed after the severance of the small rootlets, but rather more than half of those exposed to infection after cutting the larger rootlets contracted the disease. The percentage of mosaic was lower in tobacco stands where the stalks and roots were thoroughly disked in the autumn than where they were left over winter and ploughed under in the spring.

A new brown root rot disease of tobacco occurring in alkaline soils was found to be associated with *Fusarium* and *Aspergillus* spp. as well as a Phycomycete, not yet identified, but the primary cause is believed to be the nematode *Tylenchus pratensis*.

R. F. Poole contributes the following items (pp. 76–89). The best control of bacterial spot of peach (*Bacterium pruni*) was given by finishing lime (25–50), which reduced the total infection from 47·7 to 17 per cent. The greatest reduction of severe infection (14·9 to 1·6 per cent.), however, was given by zinc-lime (8–8–50) [ibid., xi, p. 660]. Good control of brown rot (*Sclerotinia fructicola*) [*S. americana*: ibid., xii, p. 11] on the Hale and other peach varieties ripening early in August was given by colloidal sulphur (up to 15–50) and zinc sulphate with lime, while lime alone and potassium permanganate delayed infection.

Dewberry [*Rubus* sp.] plants pruned just below the soil in 1929 and 1930 showed 0·4 per cent. canes killed by *Leptosphaeria coniothyrium* [ibid., x, p. 164] as compared with 10·9 per cent. on those cut by hoes, some below and some above the soil, leaving long spurs exposed. Plants pruned just below the soil in 1930 showed 1·4 per cent. dead canes, while in those pruned high the incidence of mortality due to the fungus was 43·8 per cent.

Bact. solanacearum, the causal organism of tobacco wilt, was found to tolerate a hydrogen-ion concentration of P_H 4·8, the soil reaction where the disease was most severe being equal to P_H 5·0. The incidence of black shank (*Phytophthora* [*parasitica*] *nicotianae*) [ibid., xii, p. 118] was reduced by between 11 to 17·5 per cent. by soil treatments with various copper and sulphur compounds.

In a study on the varietal reaction of sweet potatoes to scurf (*Monilochaetes infuscans*) [ibid., xi, p. 535], the Norton Yam showed only 4·4 per cent. slight and 3 per cent. severe infection, the corresponding figures for White Jersey being 77 and 45·7 per cent., for Red Jersey 73·3 and 45·2, and for Nancy Hall 74·5 and 42·9, respectively. The apparent resistance of the first-named variety is attributed to the long distance of the potatoes from the

stem. A sweet potato root rot resembling mottle necrosis [ibid., vi, pp. 506, 748], but evidently distinct, occurs on the light sandy soils of Currituck County, the Jersey varieties being most susceptible.

Biennial Report of the North Carolina Department of Agriculture from July 1, 1930 to June 30, 1932.—120 pp., 9 figs., 1932.

The following items of phytopathological interest occur in this report. In the early spring of 1932 there was a very severe epidemic of blue mould [*Peronospora hyoscyami*: *R.A.M.*, xi, p. 806] in the tobacco seed-beds, not only of the Oxford Station but throughout the flue-cured area. Bordeaux mixture 2–3–50 and 3–4–50 checked the spread of infection but simultaneously retarded the growth of the plants.

Out of 107 varieties and selections of tobacco planted in Forsyth County for black shank [*Phytophthora parasitica nicotianae*: see preceding abstract] observations, four gave promising results in 1931. Two of these were hybrids of the fire-cured Greenwood crossed on Dark Greenwood and York, the last named being a flue-cured variety, showing about 30 per cent. resistance. In 1932 five selections of cigar tobacco have shown almost 100 per cent. resistance; they were crossed with flue-cured selections and will be grown during 1933. Resistance to black root rot (*Thielavia*) [*basicola*] has been shown by selections of Paris Wrapper and Jamaica, both good flue-cured selections.

'Sand drown' was found to occur on all the tobacco plots in a fertilization scheme except those given magnesium limestone (dolomite) at the rate of 20 lb. per acre, or magnesium-potassium sulphate [ibid., xi, p. 471].

During the summer of 1931, 284 commercial peach orchards containing 1,680,386 trees were inspected, in addition to a number of home orchards, 12 phony trees being found in 8 commercial and 10 in home orchards [ibid., xi, p. 543]. All the diseased trees were cut down. In 1932 only one phony tree was found among 119,982 in 25 commercial orchards, while 17 were detected in 13 home orchards containing 163 trees in the Wadesboro district.

Bugnicourt (F.). **Travaux de cryptogamie.** [Cryptogamic work.] —ex Rapport sur le fonctionnement de la Division de Phytopathologie pendant l'année 1931. (Section sud-indochinoise de l'Institut de Recherches agronomiques.)—*Bull. Écon. Indochine*, N.S., xxxv, pp. 476B–514B, 1932.

Notes are given on a number of rice diseases occurring in Indo-China during 1931, including those due to *Helminthosporium oryzae* [*R.A.M.*, xi, p. 433], *H. sigmoideum* [ibid., xi, p. 469], *Brachysporium* sp. [ibid., x, p. 542], *Nigrospora oryzae* [ibid., vi, p. 758], *Sporotrichum* sp., *Clasterosporium* sp., *Fusarium* sp., *Cladosporium oryzae*, *Sclerotium oryzae* [ibid., xi, p. 433], two fungi with medium-sized and large sclerotia, respectively, and *S. rolfsii* [ibid., vii, p. 541].

N. oryzae is stated to cause a black discoloration of rice glumes and peduncles and sterility of the grains, the leaves being also affected.

The above-mentioned species of *Clasterosporium* has cylindrical,

echinulate, brown, biseptate conidia, 14 to 18 by 7 to 9 μ, rounded at the extremities, slightly constricted at the septa, and borne on minute, hyaline conidiophores. The fungus forms circular, reddish-grey, brown-edged spots, 1 to 2 mm. in diameter, on the leaves, and was subsequently observed producing very thick, greenish-brown cushions on the grains of an early maturing rice variety.

Cladosporium oryzae Miyake (*C. miyake* Sacc. & Trott.) forms minute, brown spots on the leaves in lines parallel with the veins. The affected foliage turns yellow, shrivels, and becomes covered with the greenish, powdery conidia. Affected plants are frequently killed.

The fungus with medium-sized sclerotia (0·5 mm. or more in diameter) causes a rot of the stem bases equally severe with that due to *S. oryzae*. In contrast to the latter, the sclerotia are always produced on the surface of the leaf sheaths at a distance of 10 to 15 cm. from the base, and not within them. The organism with large sclerotia (1 to 2 mm. in diameter) appears merely to weaken the plants without causing actual decay. The dirty- to yellowish-white sclerotia fuse into large, irregular masses on the outside of the stem bases. These two sclerotial fungi are thought to be possibly species of *Corticium*.

Among the numerous other interesting items the following may be mentioned. *Massaria theicola* [ibid., iii, p. 4] is a wound parasite of tea stems, branches, and twigs, causing severe die-back and a reddish-brown discoloration of the tissues. Perithecia, asci, and ascospores, developed in culture, exactly agreed with the description of *M. theicola*.

A species of *Fusarium* with spores measuring 60 to 70 by 7 to 8 μ caused a canker of tea branches in Annam.

Discosia theae [ibid., viii, p. 814] produces dark grey or brownish spots on the leaves of tea bushes. Under damp conditions the flattened, black pycnidia rapidly develop and give rise to very characteristic, minute pycnospores.

A species of *Fusarium* with curved, hyaline, 3- to 5-septate spores, measuring 32 to 42 by 4 to 4·5 μ, was isolated from the small, round, whitish pustules on the roots and stems of Ledgeriana, Malabar, and Succirubra *Cinchona* plants suffering from canker [ibid., xi, p. 433]. In a humid atmosphere the diseased material developed spherical, reddish-orange perithecia with a distinctly red papilla, containing asci with eight uniseptate, hyaline ascospores, rounded at both ends, constricted at the septum, and measuring 14 by 6 μ. The fungus, which is believed to be a species of *Nectria*, is responsible for heavy losses in *Cinchona* nurseries.

Cinchona seedlings (from eight months to a year old) further suffer from a wilt and black discoloration of the tips that may spread to the lower parts and cause the death of the plants. A species of *Gloeosporium* with hyaline, roughly cylindrical conidia, swollen at the tip and slightly constricted in the middle, 15 by 4·5 μ, was isolated from diseased organs, and is thought to be disseminated by the use of infected seed. A closely related species of *Gloeosporium* causes an anthracnose of *Cinchona* seedlings, the leaves of which show reddish-yellow lesions that gradually extend the whole length of the branch.

A species of *Fusarium* with 3- to 5-septate spores, measuring 24 to 30 by 3·5 to 5 μ, was isolated from long, deep furrows in the collars of two-year-old Arabica coffee plants in Tonkin.

Coco-nut palms are subject to a desiccation of the peduncles of the nuts leading to the fall of the latter. Fissures are generally apparent in the husks, from which gum exudes. Two fungi appear to be involved in the causation of this disease, namely, *Botryodiplodia theobromae* [ibid., iv, p. 35] and a species of *Gloeosporium*, the latter probably inducing the gummosis.

Control measures against most of these diseases are briefly indicated.

KLEIN (G.) & KEYSSNER (E.). **Beiträge zum Chemismus pflanzlicher Tumoren. I. Mitteilung: Stickstoffbilanz. II. Mitteilung: Über die Wasserstoffionen Konzentration in pflanzlichen Tumoren.** [Contributions to the chemistry of plant tumours. Note I: Nitrogen balance. Note II: On the hydrogen-ion concentration in plant tumours.]—*Biochem. Zeitschr.*, ccliv, 4–6, pp. 251–263, 1932.

Analytical studies [the data from which are tabulated] on the tissue contents of the tumours caused by *Bacterium tumefaciens* in beet, balsam [*Impatiens balsamina*], geranium (*Pelargonium*), and tomato showed in all cases a marked excess of albumin over that present in the healthy tissues. The ammonia, amino acid, and amide contents of the tumours were found to be higher than the normal in balsam, geranium, and tomato, and lower in the beets.

The reaction of the tumours was generally more alkaline than that of the healthy plants (those mentioned above with the addition of cucumber and sunflower) [*R.A.M.*, vi, p. 19].

KLEIN (G.) & ZIESE (W.). **Beiträge zum Chemismus pflanzlicher Tumoren. III. Mitteilung: Der Katalasegehalt von pflanzlichen Tumoren im Vergleich zum Katalasegehalt gesunden Pflanzengewebes.** [Contributions to the chemistry of plant tumours. Note III: The catalase content of plant tumours in comparison with that of healthy plant tissue.]—*Biochem. Zeitschr.*, ccliv, 4–6, pp. 264–285, 1 fig., 17 graphs, 1932.

The catalytic activity [full details of the method of estimation of which are given] in extracts of normal sugar and fodder beets was found to be much lower than that in extracts from tumours produced by *Bacterium tumefaciens* in these plants [*R.A.M.*, vii, p. 78, and preceding abstract]. A similar phenomenon was observed, to a lesser extent, in the tumours of *Pelargonium*, sunflower, *Sedum*, tomato, and balsam [*Impatiens balsamina*]. The optimum hydrogen-ion concentration for catalytic activity was found to lie between P_H 6·5 and 7.

No evidence was obtained that the bacteria themselves or substances engendered by them were directly responsible for this access of catalytic activity, although the manifestation was shown (in tumours on *Canavalia ensiformis*) to be specific to infected tissue, as distinct from normal callus. The tumours induced by

inoculation with various strains of *Bact. tumefaciens* did not differ in catalytic activity or other respects.

PASSMORE (F. R.). **A survey of damage by insects and moulds to West African Cacao before storage in Europe. Season 1930–31.**—*Bull. Imper. Inst.*, xxx, 3, pp. 296–305, 1932.

In connexion with an investigation by the Stored Products Research Branch of the Imperial College of Science and Technology on the mould spoilage of warehouse stocks, it was found that the average cacao shipped from the Gold Coast comes well within the Liverpool official grade 'A, good fermented', which allows 5 per cent. 'slatey' and 5 per cent. defective beans. Little or no correlation was observed between the moisture content of cacao when landed and the number of mouldy beans present. For instance, there were 3·2 per cent. mouldy beans in a consignment with a moisture content of 8·2 per cent. (the highest recorded in this series of observations) and 4·2 per cent. in one with the lowest moisture content of 6·6 per cent. Dade has shown [*R.A.M.*, ix, p. 164; xi, p. 703] that cacao dried to (and kept at) about 8 per cent. moisture is safe from moulds of the *Aspergillus glaucus* group, considered to be the most prevalent of the organisms growing in the interior of commercially dry cacao [cf. ibid., xi, p. 30; xii, p. 47]. It is evident, therefore, that Gold Coast cacao landed in England is not liable to further moulding unless stored under damp conditions (87 per cent. relative humidity) for prolonged periods, in which case the moisture content may rise to 9·5 per cent.

The following fungi, not hitherto reported as moulds occurring in Gold Coast cacao, have been isolated in the course of these investigations: *A. gracilis*, *A. repens*, *A. ruber*, *A. sydowi*, *A. terreus*, *Syncephalastrum cinereum*, *Scopulariopsis* sp., *Sporotrichum flavicans* var., *Penicillium citrinum* (or var.), *Actinomyces cacaoi*, I, II, and III, and *Cylindrocarpon* (*Fusarium*) sp. The three variants of *A. cacaoi* (named by Dr. S. Waksman) were isolated from the only musty sample examined, which came from Nigeria.

VOELKEL [H.]. **Die starken Schäden an Getreide im Jahre 1932.** [The heavy damage to cereals in the year 1932.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 10, pp. 79–80; 11, pp. 89–90, 8 maps, 1932.

During 1932 yellow rust (*Puccinia glumarum*) attacked barley severely in Saxony and wheat in Oldenburg and Thuringia. Brown rust caused heavy damage on barley [*P. anomala*] in Lower Franconia, on rye [*P. secalina*] in Hanover and Württemberg, and on wheat [*P. triticina*] in Hanover, Oldenburg, Silesia, Saxony, Thuringia, Baden, Württemberg, and Bavaria. Wheat was extensively attacked by black rust (*P. graminis*) in East Prussia, Lower Silesia, and elsewhere, rye in Schleswig-Holstein and East Prussia, barley in East Prussia and Württemberg, and oats in Hanover. The reduction of the wheat yield from black rust in the Breslau district (where infection was general following clover) is estimated at 25 to 50 per cent. and in one locality of Schleswig-Holstein at 80 per cent. Crown rust of oats (*P.*

coronifera and *P. coronata*) [*P. lolii*] was very severe and widespread in East Prussia. The foot rots (*Leptosphaeria herpotrichoides*, *Ophiobolus herpotrichus*, and *Fusarium* spp.) were widespread on wheat in North Germany, East Prussia, the Grenzmark, and Westphalia, rye being also severely infected in parts of Hanover, Mecklenburg, East Prussia, and the Grenzmark, while barley suffered relatively little. In the Grenzmark the disease was almost invariably observed following summer barley. So severe were the attacks of the snow mould (*F. nivale*) [*Calonectria graminicola*] on rye in parts of North Germany that areas up to 40 hect. in extent had to be ploughed up.

KLEMM. **Katastrophales Auftreten von Weizenrost in Südosteuropa.** [A catastrophic outbreak of Wheat rust in south-eastern Europe.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xii, 10, p. 81, 1932.

According to a series of reports in *Industrie und Handel* during July and August, 1932, the wheat crops in many districts of Poland, Bulgaria, and Rumania were decimated by rust [*Puccinia* spp.], resulting in a loss of 70 to 85 or even up to 100 per cent. of the harvest in some of the most prolific regions of the first-named country, e.g., Lublin, Cracow, and Lemberg. Barley and oats were also affected. In Bulgaria the fields bordering the Danube failed to yield sufficient for the seed requirements of the country, with the consequence that export was immediately prohibited. The weight of the Rumanian grain was reduced from 79 or 80 to between 62 and 70 kg. per hectol.

RIVIER (A.). **Quelques notations des rouilles du Blé.** [A few data on Wheat rusts.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 6–7, pp. 191–201, 4 graphs, 1932.

The two tables given in this paper show the relative intensity of attack (in numerical notations worked out by the evaluation method of Ducomet and Foëx) [*R.A.M.*, v, p. 349] of *Puccinia triticina* and *P. glumarum*, respectively, on eleven [named] varieties of wheat during each of the five years from 1927 to 1931 in the experimental field of the École Nationale d'Agriculture, Montpellier. The analysis of the results made by the author indicates that while certain varieties exhibit the same relative resistance or susceptibility to the rusts in different years, others vary from year to year, e.g., Touzelle rouge and Hâtif inversable which were severely rusted by *P. glumarum* in 1928 and showed considerable resistance in 1930, both bad rust years. Since in these two years no differences were observed in the amount of infective material present or in the rainfall during the critical period for infection, and since the highly susceptible Noë wheat was seriously rusted by *P. glumarum* in both years, the author believes that an explanation of this variation in relative resistance of certain varieties may be found in the different range of temperatures in the early spring; while in 1928 January and February were mild, following a cold December, in 1930 the coldest weather occurred in February, checking the vegetation of the wheat seedlings at a more advanced stage of development, and possibly bringing

about a change in the chemical constitution of the plants which rendered them more resistant to *P. glumarum*.

PETIT (A.). **Expériences préliminaires sur le traitement des rouilles du Blé.** [Preliminary experiments on the control of Wheat rusts.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 6–7, pp. 202–207, 1932.

In the experiments outlined in this paper, which were carried out in Tunis, wheat plants grown in pots were successfully protected from infection with yellow rust (*Puccinia glumarum*) and brown rust (*P. triticina*) by periodical sprayings with colloidal sulphur solutions or dusting either with precipitated sulphur or a mixture of 10 per cent. precipitated sulphur 'Codex', 1 per cent. cyanamide, 1 per cent. paraformaldehyde, and 88 per cent. lime. The protective action of the treatments is attributed both to a 'screening' effect of the fungicides which prevent the spores from reaching the leaf surface, and to their direct toxic effect on the spores. The indications so far are that the treatments should be repeated at regular intervals of 10 to 12 days, with a minimum of 4 or 5 applications per season; the minimum doses of the fungicides for each application have not yet been established.

JOHNSTON (C. O.) & MAINS (E. B.). **Studies on physiologic specialization in Puccinia triticina.**—*U.S. Dept. of Agric. Tech. Bull.* 313, 22 pp., 2 figs., 1932.

All the data concerning physiologic specialization in *Puccinia triticina* are assembled, and a key and a table of infection types for 53 physiologic forms are presented [*R.A.M.*, xii, p. 15]. A description is given of 39 physiologic forms occurring in North America. The previously unnamed differential wheat varieties, C.I. Nos. 3756, 3778, 3779, and 3747, used in the classification of physiologic forms, are named Carina, Brevit, Loros, and Similis, respectively, the last-named and Norka having been discarded as indicators on account of their resemblance to Webster and Malakoff, respectively [ibid., xi, p. 288]. Michigan Amber should also be excluded from the differential varieties by reason of its failure to react specifically to any of the physiologic forms. Certain physiologic forms, e.g., 9, 16, 31, and 37, are variable in their expression, some being apparently closely related members of integral groups that might be separated by the addition to the list of appropriate differential wheat varieties.

The distribution and prevalence of the physiologic forms in the United States appear to be independent of the occurrence of *Thalictrum* spp. Form 9 is more widespread and abundant in the Southern Great Plains (where it frequently overwinters) [ibid., viii, p. 491; x, p. 363] than other forms, but in the eastern section of the States forms 3 and 5 predominate. Form 2 was seldom isolated and occurred only over a small area in Kansas and Colorado, while 6, 10, and 11 also seem to be relatively unimportant. Of the forms described by Scheibe in Europe [ibid., ix, p. 767], only 11, 15, and 20 were encountered in these studies, the first in Washington, Idaho, Oregon, Texas, and Kansas, the second in Iowa and North Dakota, and the third in Texas and

Kansas. Forms 34 to 52, inclusive, have so far been found only in the Mississippi Valley and the eastern Plains States from Texas and Tennessee northward. Collections made in the late autumn, winter, and early spring in Kansas, Oklahoma, and Texas usually consist of form 9.

SCHMIDT (E.). **Nachweis von Quecksilber an gebeiztem Getreide.** [The detection of mercury in disinfected cereal seed-grain.]—*Fortschr. der Landw.*, vii, 19, pp. 481–483, 1 fig., 1932.

A further simplification of the electrolytic apparatus recently described for the detection of mercury and other heavy metals in disinfected cereal seed-grain [*R.A.M.*, xi, p. 706] has been introduced by the substitution of sodium thiosulphate for sodium chloride, thereby obviating the necessity for preliminary treatment with sulphuric acid. Tests with this apparatus resulted in the detection of varying amounts of mercury (estimated by the degree of oxidation of the aluminium electrode) in rye seed-grain treated with 0·25 per cent. germisan (sprinkle) for 15 or 30 minutes at 19° C., uspulun-universal 0·5 (sprinkle) and 0·2 per cent. (immersion) for 15 minutes at 18° or 19°, roggen-fusariol 0·15 (sprinkle) and 0·075 per cent. (immersion) for 15 minutes at 35° or 19°, and with the dusts abavit for 15 or 30 minutes at 19°, ceresan for 1 hour at 19°, trocken-fusariol for 15 or 30 minutes at 30°, and tutan for 90 minutes at 19°. It was further detected in wheat seed-grain immersed for 15 minutes in 0·16 per cent. weizen-fusariol at 30° or dusted for 30 minutes with tutan at 35°. No mercury was found, however, in rye seed-grain treated with tillantin or tutan for 30 minutes at 19°, or in wheat dusted with tutan for 15 minutes at 35°.

BECKER (K. E.). **Sparmassnahmen bei der Getreidebeizung.** [Economies in cereal disinfection.]—*Deutsche Landw. Presse*, lix, 43, p. 538, 1932.

Figures are given showing the present costs of the treatment of cereal seed-grain with the four so-called 'universal' disinfectants, viz., ceresan, germisan, and uspulun-universal liquids, and ceresan dust, all applicable against wheat bunt [*Tilletia caries* and *T. foetens*], snow mould of rye [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium gramineum*], and loose smut of oats [*Ustilago avenae*: *R.A.M.*, xii, p. 84]. The cost of dusting 50 cwt. of wheat seed-grain with ceresan is Pf. 42 per cwt., the corresponding figures for the short disinfection process being 23 to 35, sprinkling 26 to 29, and immersion 10 to 12·5. There is thus a difference of some M. 16 between the cost of dusting 50 cwt. and that of the cheapest (and equally effective) immersion treatment. For rye the relative costs are similar, while for barley they are considerably higher, viz., dusting Pf. 62, short disinfection 39 to 44, sprinkling 32, and immersion 10·5 to 15, making a difference between dusting and immersion of M. 25·87. For oats the figures are as follows: dusting M. 1·03, short disinfection Pf. 74 to 94, and immersion 18 to 31·5. The last-named method, however, is impracticable on a large scale and sprinkling ineffectual.

Petit (A.). **Nouvelles observations sur le traitement de la carie du Blé (Tilletia levis Kühn), du charbon de l'Orge (Ustilago hordei Persoon, Kellerman et Swingle) et du charbon de l'Avoine (Ustilago avenae Persoon, Kellerman et Swingle).** [New observations on the control of Wheat bunt (*Tilletia levis* Kühn), covered smut (*Ustilago hordei*, Persoon, Kellerman & Swingle) of Barley, and loose smut (*U. avenae* Persoon, Kellerman & Swingle) of Oats.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 6–7, pp. 208–213, 1932.

As a result of experiments carried out in Tunis in 1931, the author states that good commercial control of Wheat bunt (*Tilletia levis*) [*T. foetens*], covered smut (*Ustilago hordei*) of barley, and loose smut (*U. avenae*) of oats is afforded by dusting the seed-grain with cuprous chloride at the rate of 350 gm. per quintal [50 kg.] of seed, or with a powder containing from 10 to 15 per cent. bihydrated cupric chloride ($CuCl_2$ $2H_2O$) at the same rate [*R.A.M.*, xi, p. 552]. The addition of 5 per cent. of a mercury salt renders the dusts protective against insect attack on the seed-grain. He further believes that where varieties of cereals resistant to the smuts are sown and the degree of smut contamination is not great, the seed-grain may safely be disinfected with a powder containing as little as 5 per cent. of the cupric chloride and applied only once in every two or three years. Dusting the seed-grain with polymerized forms of formaldehyde long before sowing is deprecated as injurious to the resulting seedlings.

Pichler (F.). **Kalkstickstoff als Staubbeize gegen Weizensteinbrand?** [Calcium cyanamide as a disinfectant dust against Wheat bunt?]—*Deutsche Landw. Presse*, lix, 40, p. 503, 1932.

Following on the work of Feucht and previous investigators on the control of wheat bunt [*Tilletia caries* and *T. foetens*] in Germany by dusting with calcium cyanamide [*R.A.M.*, xi, p. 565], the writer conducted a series of field and laboratory experiments to determine the applicability or otherwise of this method to Austrian conditions. The seed-grain of Hainisch winter wheat was mixed for ten minutes in glass tubes with 5, 10, or 20 gm. of unoiled calcium cyanamide per kg. and planted out in three different localities on 8th and 30th October and 11th November, 1931. Laboratory tests had already shown that calcium cyanamide at the rate of 5 gm. per kg. is only partially effective against bunt and at the same time causes a reduction of germination, and the results of the field experiments [which are tabulated] were not such as to justify the use of this substance for fungicidal purposes.

Mourashkinsky (K. E.). **Влияние различных источников спор Tilletia tritici и T. levis на пораженность Пшеницы головней. II.** [Effect of the source of origin of *Tilletia tritici* and *T. levis* spores on the susceptibility of Wheat to infection with bunt. II.]—ex *Болезни зерновых культур* [*Diseases of Cereal crops*], issued by *Siberian Scient. Res. Institute for Cereal Industry*, Omsk, pp. 4–14, 1932.

The results of the experiments reported in this paper [which were made in continuation of the work described in a previous

communication: *R.A.M.*, vii, p. 434] showed that passage of a given strain of *Tilletia tritici* [*T. caries*] or *T. levis* [*T. foetens*] for five consecutive years through the same variety of wheat considerably increased the virulence of that strain to that host. This applied to all the varieties tested included in all the species of *Triticum*, with the exception of *T. durum* var. *hordeiforme* 010 and *T. persicum*, the susceptibility of which to the strains grown on them remained, for some unknown reason, practically unchanged throughout the experiments. The results [shown in tabular form] of cross-inoculations in 1930 and 1931 indicated further, in opposition to the provisional view previously expressed [loc. cit.], the existence of considerable variation in the response of any given variety to infection with strains grown on other varieties or species, the differences noticed in the reactions being not less than those observed in the case of different geographical or biological strains.

In the author's opinion, these results admit of two alternative explanations. Either the collections of bunt spores used in the initial inoculation experiments in 1925 consisted of a mixed population of different strains which, by continued passage through the same variety, was reduced through suppression of the less pathogenic strains to a single strain specialized to the given variety [ibid., xi, p. 500]; or the original virulence of the spore population to the variety was increased by the production, by hybridization and mutations, of new strains. In the light of the experiments the latter alternative appears to be the more probable one; otherwise it would be hard to explain such increases in infection percentages as that, for instance, shown by *T. dicoccum* (with *T. foetens*), which rose from 6·8 to 43·1 at the end of five years' passage of the original strain through this host; and if such is the case the problem of breeding varieties of wheat for resistance to bunt would be impossible of solution.

Mourashkinsky (K. E.). О методике определения пораженности Пшеницы мокрой головней. [On the determination of the degree of infection of Wheat with bunt.]—ex *Болезни зерновых культур* [*Diseases of Cereal crops*], issued by *Siberian Scient. Res. Institute for Cereal Industry*, Omsk, pp. 62–71, 1932.

The author points out that the usual method of determining the degree of infection of a wheat field with bunt [*Tilletia caries* and *T. levis*] by counts of infected plants does not represent the actual losses caused by the disease, which, as indicated in a previous communication [*R.A.M.*, v, p. 352], are considerably increased by the death, during their development, of a large percentage of the bunted plants. This was clearly demonstrated in experiments in 1931 and 1932 at Omsk, in which clean and artificially infected (with *T. caries*) lots of seed-grain of *Triticum vulgare* var. *caesium* were grown in parallel plots under strictly comparable conditions. At harvest time, the degree of infection of the plants was determined by the usual count of diseased plants in the plots (giving the 'apparent' loss), and also by counts of the number of normal plants in the plots raised from clean seed and in those raised from bunted seed, the difference in which represented the 'actual' loss.

In every case the difference between the 'apparent' and the 'actual' loss was very high, the latter, in one case, being as much as nine times the 'apparent' loss.

With a few exceptions (presumably due to local ecological conditions), the experiments also confirmed the generally admitted view that wheat sown late in the season is less liable to infection with bunt than that sown earlier, and that dense stands are more heavily attacked than thinner ones. There was also some indication that wheat plants growing on ridges exhibited a higher 'actual' and lower 'apparent' degree of infection than those growing in the furrows, especially in the very dry year, 1931. Applications of sulphate of ammonium, superphosphate, and a complete fertilizer did not affect the incidence of bunt, but applications of K_2O alone at the rate of 45 kg. per hect. slightly increased both the apparent and actual infection. The apparent infection was highest on soil freshly broken from grass and lucerne and lowest on soil tilled for several years consecutively, the reverse being true for the actual infection.

Dobromysloff (P. N.). Пораженность яровой Пшеницы мокрой головней при бороздовом и рядовом посевах. [Degree of infection with bunt of spring Wheat grown in ridged as against flat rows.]—ex *Болезни зерновых культур* [*Diseases of Cereal crops*], issued by *Siberian Scient. Res. Institute for Cereal Industry*, Omsk, pp. 72–79, 2 graphs, 1932.

Details are given of experiments at Omsk in 1931 to test the effect of the method of cultivation (ridged or flat rows) on the susceptibility of wheat to infection with bunt [*Tilletia caries*]. The results [which are presented in graphical and tabular forms] showed that the 'apparent' infection was highest and the 'actual' infection [see preceding abstract] lowest in the flat rows, with the exception of the latest date of sowing, where both types of infection were higher in the ridged rows. These results would indicate that the flat method of wheat growing, under the local ecological conditions, is more favourable to the development of the disease during the early stages of growth than that of ridged rows.

Smith (W. K.). **Reaction of Martin Wheat to three physiologic forms of Tilletia tritici.**—*Phytopath.*, xxii, 10, pp. 847–850, 2 figs., 1932.

The writer has shown elsewhere that the physiologic form T2 of *Tilletia tritici* [*T. caries*] is readily distinguishable from T1 and T3 by the reaction of Martin (C.I. 4463). The differences apparent in Martin between bunt-free culms and those infected by T3 are similar to those described by Barrus (*Phytopath.*, vi, p. 21, 1916) in respect of Dawson's Golden Chaff.

The following differences were apparent at maturity between T2 and T3 in a test at Pullman, Washington. Spikes infected by T2 are more lax than those attacked by T3; the average length of ten internodes in the middle of the head for the T2 group was 6·93 ± 0·08 cm. compared with 5·72 ± 0·04 cm. for the T3. The T2 smut balls do not protrude from the glumes, owing to their

very small size (0·5 to 3·5 mm. in length as against 4·5 to 6·5 mm. for those of T3), and contain a large proportion of apparently immature, thin-walled, distorted spores.

The reaction of Martin to T2 is considered to denote a form of resistance [cf. *R.A.M.*, xii, p. 85].

Flor (H. H.), Gaines (E. F.), & Smith (W. K.). **The effect of bunt on yield of Wheat.**—*Journ. Amer. Soc. Agron.*, xxiv, 10, pp. 778–784, 1932.

The effect of the wheat bunt (*Tilletia tritici*) [*T. caries*] load and of the percentage of smutted heads in the crop on yield was tested at Pullman, Washington, in 1929–30, using Hybrid 128 (C.I. No. 4512) as a susceptible variety, Turkey (C.I. No. 6175) as moderately susceptible, and Ridit (C.I. No. 6703) as resistant. The first named was susceptible to all seven physiologic forms composing the inoculum, including form 1 of *T. caries*, the most prevalent in the Pacific Northwest [*R.A.M.*, xii, p. 18, and preceding abstract]. Turkey was resistant to this form, but susceptible to five of the others, while Ridit was resistant to all the forms used in the tests. It was found that an average increase of 16·2 per cent. bunt with Hybrid 128 reduced the yield by 20·5 per cent., the corresponding figures for Turkey being 30·3 and 23·1, and for Ridit 1·13 and 11·3 per cent., respectively. In the last-named variety the reduction is probably due in part to the morphological reactions of the plants to infection, e.g., dwarfing of the culms, failure to head, and distortion and partial sterility of infected heads.

Bressman (E. N.). **Lolium infected with bunt of Wheat.**—*Phytopath.*, xxii, 10, pp. 865–866, 1 fig., 1932.

Seed of *Lolium perenne* and *L. multiflorum* coated with an inoculum consisting of equal parts of the ten physiologic forms of wheat bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] previously described by the writer [*R.A.M.*, xi, p. 33] yielded three smutted heads, one in the former and two in the latter species, containing spores typical of *T. foetens* in size, shape, and texture. When broken, the sori emitted an extremely strong odour characteristic of wheat bunt [ibid., xi, p. 775]. A number of other grasses [which are enumerated] were similarly inoculated with negative results. *T. lolii* Auersw., which has been described on *Lolium*, is thought to be possibly a form of wheat bunt related to *T. caries*. No reports of the spontaneous occurrence of bunt on *L. perenne* or *L. multiflorum* in Oregon are available.

Busse (G.). **Pflanzenkrankheiten — Fruchtfolge und Düngung.** [Plant diseases—crop rotation and manuring.]—*Deutsche Landw. Presse*, lix, 42, p. 526, 1932.

In order to counteract the ravages of foot rot [chiefly *Ophiobolus graminis*: *R.A.M.*, xi, p. 775] in the German wheat stands, the writer recommends lucerne or oats as preceding crops. Stable manure should be applied to the oat stubble, and caustic lime strewn over the field at the rate of 1 to 1·5 doppelzentner per ¼ hect. a week before sowing the wheat.

Feistritzer (W.). **Haben die neueren Untersuchungsergebnisse über Fusskrankheit einen Einfluss auf die Sortenwahl?** [Have the results of recent investigations on foot rot an influence on varietal selection?]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlvii, 44, pp. 791–793, 3 graphs, 1932.

An account is given of the writer's recent experiments (1930–1 and 1931–2) at Kleinwanzleben [Saxony] on the possibilities of combating the foot rots of cereals (caused to the extent of 75 per cent. by *Fusarium* spp. and 25 per cent. by *Ophiobolus* [*graminis* and *herpotrichus*] and *Leptosphaeria* [*herpotrichoides*] in the locality named) [*R.A.M.*, xii, p. 19] by attention to cultural practices, viz., field preparation, time of sowing, and crop rotation.

A severely infested plot was divided into four parts, of which one was hoed and after 14 days ploughed to a depth of 24 cm.; the second turned with a disk-harrow and then similarly ploughed; while the third and fourth were ploughed immediately from the stubble to depths of 24 and 34 cm., respectively. Each plot was sown with the same varieties under identical conditions for the purpose of comparative observations. On both wheat (Rimpau's Hybrid and Carsten V winter and Heine's Kolben and Peragis summer) and barley (Friedrichswerther and Peragis winter and Heine's Hanna and Isaria summer) the incidence of infection was greatly reduced (from 11·4 to 19·3 per cent.) by immediate deep ploughing under of the stubble, giving an increased yield, which with the winter cereals ranged from 8 to 10 doppelzentner per hect. In both years there was a decline of foot rot in the later sown winter wheat stands (end of November and early December), especially where potatoes were grown as the preceding crop. The sequence of winter wheat and winter barley is undesirable, but even in this rotation a decrease of infection may be obtained by a combination of late sowing and deep ploughing immediately after harvest. The course of the disease did not appear to be influenced by any of the synthetic fertilizers used in the tests. The deep cultivation, however, led to too luxuriant growth in the early stages and this tended to increase both lodging and foot rot, so that it is necessary to be sparing in the use of nitrogen and to grow varieties that are naturally resistant to lodging.

Guyot (A. L.). **De l'évolution du piétin des céréales en rapport avec certains facteurs météorologiques.** [The development of foot rot of cereals in relationship to certain meteorological factors.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 6–7, pp. 215–228, 3 graphs, 3 diags., 1932.

In the study reported in this paper of the seasonal development of foot rot of cereals [*Ophiobolus graminis*, *Cercosporella herpotrichoides*, *Leptosphaeria herpotrichoides*, *Wojnowicia graminis*, and *Fusarium culmorum*: *R.A.M.*, ix, p. 641; xi, p. 503] in France, use was made of the fact that the sulphuric acid treatment recommended for the control of the disease [ibid., vi, p. 403], by killing the infected tissues of the host plant, has a fixing effect on the parasitic organisms, this allowing of the study at leisure of the stage attained in their development at the moment of the treatment. The results of histological examinations in 1925 in

Picardy, and in 1929 and 1931 in the neighbourhood of Paris, of cereal plants thus treated at different dates (from the beginning of March to the middle of May), taken in conjunction with the meteorological data for the periods preceding the treatment, indicated that in each of the years under review the development of foot rot could be differentiated into two periods, each covering some 120 days, which the author terms 'quiescent' ('calme') and 'critical', respectively. From the meteorological standpoint, each of these periods was characterized as follows. During the quiescent period the rainfall never exceeded 7 mm. for any interval of 6 consecutive days, with an average of 2·4 mm., and sunshine was in every case over 18 hours during the same interval, with an average of 39·3 hours. During the critical period, on the other hand, in 50 per cent. of the cases rainfall exceeded 10 mm. during any 6 consecutive days, with an average of 12·6 mm., and sunshine was on an average 25 hours and was below 18 in 50 per cent. of the periods. These observations support the opinion previously arrived at that prolonged rains and overcast weather favour the development of foot rot of cereals, and are believed to throw further light on certain obscure points in the etiology of the disease.

GRAHN. **Haben wir die Gefahr und Bekämpfung des Weizenhalmtöters richtig erkannt?** [Have we correctly recognized the danger and need for control of the Wheat strawbreaker?] —*Deutsche Landw. Presse*, lix, 43, pp. 537–538, 1932.

Heavy damage is stated to be caused in Mecklenburg and Schleswig-Holstein by the wheat strawbreaker (*Ophiobolus herpotrichus*) [*R.A.M.*, ix, p. 448; xi, pp. 495, 503]. The foot rot caused by this fungus is generally absent or of little importance where a beet-oats-wheat crop rotation is practised. In a stand under the writer's observation (two-thirds following Victoria peas and one-third beans) the former portion remained healthy, while some 25 per cent. of the latter was destroyed by *O. herpotrichus*. The answers to a *questionnaire* intended to elicit information as to the conditions favouring infection by the strawbreaker were so conflicting as to necessitate further investigations on this very acute problem.

SCHAFFNIT (E.). **Zu den bisherigen Ernteschäden durch Lagern des Weizens.** [On the crop losses hitherto sustained through lodging of Wheat.]—*Deutsche Landw. Presse*, lix, 43, pp. 535–536, 2 figs., 1932.

In May, 1932, the writer isolated at Bonn a fungus, hitherto not reported in Germany, from the elongated-oval, pale, brown-edged lesions on wheat haulms affected by the 'straw-breaking' as opposed to the 'blackleg' form of parasitic lodging [cf. *R.A.M.*, xi, p. 444 and preceding abstracts]. *Fusarium culmorum* and *F. nivale* [*Calonectria graminicola*] frequently occur in a secondary capacity on the diseased plants. Heavy losses may be caused by the newly detected parasite, which reduced the yield on a well-known estate in Saxony from 18·70 cwt. per ¼ hect. on a healthy plot to 13·45 cwt. on a diseased one, while only 7 cwt. per ¼ hect.

was harvested on a badly affected area in the Cologne district. The disease occurs with particular severity in wheat crops following peas. Cultural measures tending to diminish infection are briefly indicated.

SAMUEL (G.) & GARRETT (S. D.). **Rhizoctonia solani on cereals in South Australia.**—*Phytopath.*, xxii, 10, pp. 827–836, 2 figs., 2 graphs, 1 map, 1932.

Wheat, oats, barley, and pasture plants (grasses and others) on the so-called 'mallee' (dwarf *Eucalyptus*) soils of South Australia are affected by a seedling disease caused by *Rhizoctonia* [*Corticium*] *solani*, a preliminary note on which has already appeared [*R.A.M.*, viii, p. 96]. The soils under observation are usually characterized by alternating sand ridges and red loam flats overlying a shallow limestone, with a strongly alkaline reaction (P_H 8 to 9) and an average annual rainfall of 12 to 18 in.

The most conspicuous symptoms occur on the roots, the tips or intermediate portions of which are so severely attacked that they lose all turgidity and assume a flaccid, water-soaked appearance. The cortex soon rots away and the central cylinder breaks, leaving nothing but a brown stump. The fungus isolated from the diseased plants was compared with three strains of *C. solani* from potatoes and readily identified as the same species. In the early stages, when isolations are most easily made, the cortical tissues are full of the stout, hyaline, intracellular hyphae, 10 μ in diameter, but with the disintegration of the tissue only the long, slender, brown, distributive hyphae, 7 μ in diameter, can be discerned. The maximum, optimum, and minimum temperatures for the growth of both the potato and cereal strains of *C. solani* were 32°, 23° to 26°, and 4° C., respectively. The potato strain showed a slightly less acid optimum reaction than the cereal (P_H 6·5 to 7 as against 6 to 6·5). Cross-inoculation experiments with the wheat and potato strains indicated that both hosts may be attacked by either strain, as already shown by Rayllo in Russia [ibid., vi, p. 747]. It was demonstrated by experiments (in Wisconsin soil temperature tanks) that the infection of Federation wheat by *C. solani* was most severe at a range of 12° to 17°, the effects at higher temperatures being almost imperceptible.

PUGH (GRACE W.), JOHANN (HELEN), & DICKSON (J. G.). **Relation of the semipermeable membranes of the Wheat kernel to infection by Gibberella saubinetii.**—*Journ. Agric. Res.*, xlv, 10, pp. 609–626, 8 figs., 1932.

This is a detailed and fully illustrated account of the authors' investigation (based on the examination of naturally and artificially infected material in 1923 and 1924) of the mechanism of infection of wheat grains by *Gibberella saubinetii* in relation to the structure of the grains at different stages of maturity. In infections at flowering time the fungus penetrates readily at the brush end of the grain, the hyphae advancing from the infected anthers to the ovary. At that stage the membranes of the testa are thin, and give poor protection to the young seed against invasion by the fungus, with the result that a high percentage of the grains are so

badly diseased as to be practically worthless. With advancing age the testa becomes increasingly resistant to penetration by *G. saubinetii*, the degree of resistance of its various membranes being apparently proportional to their thickness, and the outer, semi-permeable membrane being the most resistant. In wheat grains infected at maturity, the parasite is usually localized at the embryo end, and is sparse in the testa, nucellar layer, and endosperm. The aleurone cells may be filled with hyphae for considerable distances along the groove, for a shorter distance on the dorsal side, and a still shorter distance on the flanks. The embryo is more or less completely permeated by the hyphae. The penetration and spread of the fungus inside the wheat grain are apparently greatly influenced by the location and structure of the protective parts, especially the layers of the testa, and also by the distribution of water within the grain.

Ziling (M. K.). ,,Черный зародыш'' Пшеницы. ['Black germ' of Wheat.]—ex *Болезни зерновых культур.* [*Diseases of Cereal Crops*], issued by *Siberian Scient. Res. Institute for Cereal Industry*, Omsk, pp. 15–39, 1932.

The author states that a condition of wheat grains very similar to that known in Italy as 'puntatura' [*R.A.M.*, v, p. 663] and to that described from Morocco as 'moucheture' [ibid., x, pp. 20, 21], is known to have occurred in Siberia at least since 1914. Increased incidence of the trouble of recent years (especially in 1932, presumably owing to the very wet conditions of that year), induced him to undertake an extensive survey, which showed that the disease is widespread over the whole of Siberia and the Russian Far East, and that *durum* wheats are considerably more affected by it than those of the *vulgare* group. Isolations from diseased grains germinated on filter paper yielded *Alternaria tenuis* in 82 to 95 per cent., *Helminthosporium sativum* in 15 to 60 per cent., *Fusarium* spp. in about 4 per cent., and a number of unidentified fungi in some 2 per cent. of the cases. Bacteria were not present.

Macroscopically, wheat grains infected with *A. tenuis* are readily distinguishable from those infected with *H. sativum* in that the former are usually larger and heavier, while the latter are smaller and lighter than normal. Further, in infection with *A. tenuis*, the brown discoloration, of varying intensity, is limited to the embryo region, with a narrow brown line extending along the groove up to the brush end; the mycelium is usually located in the pericarp, penetrating to the integument (more rarely to the aleurone layer and very exceptionally to the endosperm), but never entering the germ. When *H. sativum* is concerned, the external brown discoloration may extend to other portions of the grain; the mycelium permeates both the pericarp and the endosperm, and not infrequently also attacks the germ which, in severe cases, may be mummified.

Further studies showed that under controlled conditions the germinability of infected seeds was reduced by 2·4 per cent. in *A. tenuis* and by 33·3 per cent. in *H. sativum* infections. The viability of the grains attacked by *Fusarium* spp. was reduced by 50 per cent. The content of the grains in nitrogen, fatty substance,

and gluten was affected by the two common fungi differently. As indicated by experiments in 1931 and 1932 near Omsk, the incidence of the disease caused by both organisms was but slightly affected by the nature of the soil, preceding crop, or fertilizers used. Of the two fungi *H. sativum* appears to be the more dangerous, and work is in hand to find control measures against it.

Maier-Bode. **Unterlassung der Beizung gilt als Fahrlässigkeit.** [The omission of disinfection counts as negligence.]—*Deutsche Landw. Presse*, lix, 43, p. 538, 1932.

The occurrence of stripe disease of barley [*Helminthosporium gramineum*] and bunt of wheat [*Tilletia caries* and *T. foetens*] on a German estate which had recently changed hands was adjudged by the receiving commission to be due to negligence in the omission of seed-grain disinfection on the part of the former owner, from whom compensation was accordingly exacted. The loss in the barley crop was estimated at 4 cwt. per ¼ hect.

Tapke (V. F.). **An undescribed loose smut of Barley.**—*Phytopath.*, xxii, 10, pp. 869–870, 1932.

Further studies at Washington, D.C., on the infection of barley by loose smut through seed inoculation [*R.A.M.*, iv, p. 271], have shown that the disease may be caused by either of two fungi, viz., *Ustilago nuda*, or a species with dark chocolate-brown spores for which the name *U. nigra* n. sp. is proposed. The spores of the new species measure 6·5 to 7 μ compared with 5·5 to 6 μ in *U. nuda*, and remain viable for eighteen months as against only three to six or occasionally twelve months in the latter. Complete control of *U. nigra* in plants from seed from inoculated flowers may be obtained by dusting the seed with ceresan or immersing it for 90 minutes in 1 in 320 formaldehyde, whereas this method is ineffectual against *U. nuda*. A further difference between the two forms of smut is that *U. nigra* can cause seedling infection through the inoculation of mature seed with spores, while *U. nuda* is unable to do so.

Majdrakoff (P.). **Versuche mit der Streifenkrankheit der Gerste (Helminthosporium gramineum Rabh.) unter besonderer Berücksichtigung der Infektions-, Beiz- und Immunitätsfrage.** [Experiments with the stripe disease of Barley (*Helminthosporium gramineum* Rabh.) with special reference to the questions of inoculation, disinfection, and immunity.]—*Bot. Arch.*, xxxiv, 3–4, pp. 337–362, 2 diags., 1932. [English summary.]

Using an adaptation of the methods already worked out at Leipzig for studies on loose smut of oats [*Ustilago avenae*] and stripe disease of barley (*Helminthosporium gramineum*) [*R.A.M.*, v, p. 547; ix, p. 710; x, p. 92], the writer conducted a series of investigations on the latter disease.

Conidia for inoculum were obtained by knocking them off the infected leaves with beads or quartz grains. The beads or quartz particles should measure 3 to 4 mm. in diameter, their ratio to the

dried leaves being as 20 : 1 by weight. The conidia are separated by passing through two sieves, the first of 1·5 mm. diameter and the second of 0·15 mm., placed one above the other in a closed container and shaken for three to five minutes by a horizontal movement. Inoculation was successful when the seed-grain was immersed for one hour in a conidial suspension at room temperature and then transferred for three hours to an incubator at 25° to 28° C., with an atmospheric humidity of 90 to 100 per cent. Positive results were further obtained by one hour's immersion of the seed-grain in a conidial suspension at 25° without subsequent removal to the incubator. An increase in the infection percentages was obtained by the following measures: (*a*) multiplying the number of conidia in the suspension (up to 1 gm. per 100 c.c. of nutrient solution); (*b*) regulating the temperature during the germination of the seedlings, the highest percentage of infection being obtained usually at 4°, the next at 25°, and the lowest at 8·8°; (*c*) adjusting the soil moisture capacity to 30 or 90 per cent.; and (*d*) use of old seed-grain with reduced germinability. Temperature was found to be the most important of these factors.

The following procedure gave satisfactory results in varietal reaction and disinfection tests. The seed-grain is placed on fairly damp blotting-paper and exposed to a temperature of 4°. After germination (which generally takes seventeen days at this low temperature) the seedlings are planted out in boxes filled with a mixture of $\frac{1}{3}$ sand and $\frac{2}{3}$ soil, where they remain without further temperature adjustment until the ears are formed, when infection counts are made.

The best control of stripe disease, both in laboratory and field experiments, was given by thirty minutes' immersion in 0·125 per cent. germisan. Uspulun-universal (one hour at 0·25 per cent.) and tillantin dust (200 gm. per 50 kg.) were moderately efficacious, while formaldehyde gave very poor results.

In the varietal reaction trials a six-rowed Bulgarian form and Streng's winter barley proved highly resistant, while Bürckner's Silesian, Almerfelder, Eckendorfer Mammoth, Janetzki's early, and Engelen's medium-early were susceptible. Of the summer varieties, Heil's Franken and Heine's Goldthorpe were resistant and Pflug's 'Intensiv' was highly susceptible; other susceptible varieties were Streng's Franken, Eglfinger Hado, Pflug's 'Extensiv', Ackermann's Bavaria and Danubia, and Heine's and Mittlauer Friedrich's Hanna.

The infection percentages hitherto obtained are not really adequate for disinfection and varietal reaction tests. This may be partly attributable to the relatively low incidence of stripe disease under natural conditions, but it would seem that the present inoculation methods still leave room for improvement.

Smith (N. J. G.) & Putterill (K. M.). **Pycnidia produced by Helminthosporium parasites of cereals and wild grasses.**—*S. African Journ. of Sci.*, xxix, pp. 286–295, 5 figs., 1932.

The production of pycnidia in culture by *Helminthosporium teres*, *H. gramineum*, and *H. avenae* [*R.A.M.*, x, p. 373, and next abstract], collected in various parts of England and Scotland, has

been observed by the senior author between 1922 and 1932. One South African isolation of *H. teres* from Grahamstown, Cape Colony, has also formed pycnidia. Among the media stimulating pycnidial formation were potato agar, Brown's synthetic (asparagin) [ibid., vii, p. 475], and barley leaf decoction agar. Neither temperature nor light appears to be of paramount importance in the process. Pycnidia were extensively formed in cultures contaminated by other fungi or bacteria.

At Cambridge, pycnidia of *H. teres* were found in fair numbers on old barley straw, while the chaff of a dry oat grain has been observed to bear a pycnidium of *H. avenae*. In South Africa fairly old leaves of *Cynodon dactylon* infected by a *Helminthosporium* bear abundant piriform pycnidia up to 75 μ in diameter (110 μ in culture), the development of which is described in some detail. In the central cavity one or more layers of active cells give off fine unbranched, deeply staining hyphae, which fill the cavity and converge towards the neck of the fruit body. These hyphae then become separated from the collapsed cells from which they arise, and transverse constrictions eventually break them up each into several hyaline pycnospores, 5 to 6 by 3 μ in diameter. Germination has not been observed. The dark brown, 3- to 5-septate *Helminthosporium* conidia of this fungus, which are produced together with the pycnidia, measure on an average about 20 by 8 μ, though they may attain 42 μ in length and nearly 16 μ in width. In culture they are borne in very large clusters on dark conidiophores, and they germinate in a bipolar fashion. On the host this fungus causes dark brown lesions of indefinite outline on the leaves and sheaths. It differs from *H. cynodontis*, which is common at Grahamstown and has more hyaline conidia, about twice as long as those of the pycnidium-forming species; in fact, some of the conidia in the writer's cultures are longer than the largest cited by Drechsler [ibid., iii, p. 65].

The pycnidia of *H. teres* observed by the writers were usually smaller than those previously described by Ravn and their pycnospores are budded off from the ends of short, deeply staining hyphae which arise as radially directed prolongations of irregularly arranged, rounded cells bounding the cavity of the pycnidium. *H. gramineum* and *H. avenae* appear to have pycnidia resembling those of *H. teres*.

O'Brien (D. G.) & Dennis (R. W. G.). **Further experiments on leaf stripe of Oats.**—*Scottish Journ. of Agric.*, xv, 4, pp. 406–410, 1 pl., 1 fig., 1932.

Further investigations have been conducted at the West of Scotland Agricultural College on the etiology and control of leaf stripe of oats (*Helminthosporium avenae*) [*R.A.M.*, xi, p. 295].

In an experiment carried out in March, 1932, no leaf stripe developed in plots from seed treated with ceresan, whereas 22·8 per cent. occurred on a control section. It has been estimated by seedling counts that four bushels per acre of treated seed-grain give a yield equivalent to that from five bushels untreated. In a test with the highly susceptible Yielder variety, the treated section gave 218 seedlings per unit area, compared with 170 on the

untreated. Treatment thus imposes a reduction of 20 to 25 per cent. in the sowing rate.

The mycelium of *H. avenae* is invariably present on seed harvested from an infected crop. It is situated mainly at the tip of the inner and outer palea, whence the infection of the emerging shoot takes place. As the coleoptile grows out between the tips of the paleae, it comes into contact with this mycelium and becomes infected at the two points of contact with the paleae. As successive regions of the coleoptile pass the infective points, two narrow, brown, longitudinal lesions are formed on each side.

The fungus was found to develop freely only on sterilized soil and to be quite unable to compete with the normal saprophytic fungi of the field. Portions of an active culture of *H. avenae* were placed in the soil at a little distance from healthy oat seed-grain under controlled conditions favouring leaf stripe development, but no trace of disease occurred in the seedlings. The resting mycelium and sclerotia of the fungus may be found in profusion on stubble left from an infected crop, and are capable of overwintering in the open as easily as on harvested grain. When such stubble is ploughed in, therefore, it affords a ready source of infection for the new crop if sown on the same land and if the seed comes into direct contact with the fungus.

Even the complete elimination of primary infection by seed treatment does not necessarily confer protection from the secondary phase of conidial dissemination, as shown by a test in 1931 in which all the plants of an originally clean, ceresan-treated plot developed leaf stripe in the late summer. Annual seed treatment with an effective fungicide must, therefore, be given.

The results of seed-grain treatment were not so striking in 1931, when the harvesting period was relatively fine, as in the wet season of 1930.

The examination of seed samples from various localities in the north, midlands, and south of England showed that leaf stripe is widespread in Great Britain, the amount of infection in this material ranging from 4 to 72 per cent. according to the variety and place of origin. Individual strains of the fungus have shown the marked morphological and physiological variations in culture typical of the genus.

ALLEN (RUTH F.). **A cytological study of heterothallism in Puccinia coronata.**—*Journ. Agric. Res.*, xlv, 9, pp. 513–541, 16 pl., 1932.

This is a detailed and fully illustrated account of the author's study of heterothallism in *Puccinia coronata* [*P. lolii*] a preliminary paper on certain parts of which has already been noticed [*R.A.M.*, x, p. 235]. As the spermogonia develop, hyphae from them, or from the vegetative mycelium, or from young aecidia grow out to the surface through the stomata or between the epidermal cells. These serve to receive the nuclei from spermatia of opposite sex. From their tips the sporophytic generation arises by growth of diploid hyphae and probably also by nuclear divisions and migrations through the existing haploid hyphae. The

aecidium may begin as a haploid body or may be formed of both haploid and diploid hyphae from the start. Occasional cell fusions are found in it, sometimes between uninucleate cells, sometimes between cells, one or both of which contain more than one nucleus. The basal cells from which the spore chains arise are predominantly binucleate, the spores always so.

Blattný (C.). **Zur Diskoloration der Haferblätter infolge Magnesiummangels.** [On the discoloration of Oat leaves in consequence of magnesium deficiency.]—*Zeitschr. für Pflanzenernährung, Düngung und Bodenkunde*, A, xxvi, 3–4, pp. 216–218, 1 fig., 1932.

Oat plants growing in sandy soil (formerly a vineyard) in Czecho-Slovakia showed a longitudinal mottling of the leaves running parallel with the veins, accompanied by an inward rolling of the tips. The affected leaf areas, which were sharply differentiated from the normal tissue, ranged from pale green in the youngest (heart) leaves to white in the dead ones.

When some plants were removed from this site to soil with a fairly high magnesium content, they rapidly lost the symptoms of mottling and acquired a rich green tint. A further series replanted in the original vineyard soil but receiving a top-dressing of magnesium sulphate (0·06 gm. per plant) regained a normal green coloration in three weeks. A close connexion is thus demonstrated between magnesium deficiency and longitudinal mottling of oat leaves [cf. *R.A.M.*, xi, p. 101].

Borghardt (A. I.). Современное состояние вопросов в области познания болезней Кукурузы. [The present state of our knowledge of the diseases of Maize.]—*Scient. Res. Inst. for Maize and Sorghum Cultivation*, Dniepropetrovsk, *Publ.* 28, 53 pp., 9 figs., 1932.

This is a brief but comprehensive compilation from the literature [largely American] on the chief diseases that attack maize throughout the world. By far the greatest space is given to the two smuts *Ustilago zeae* [*R.A.M.*, xi, p. 569] and *Sorosporium reilianum* [ibid., x, p. 590], which are stated to cause the most damage to the crop in Soviet Russia. *Sclerospora graminicola* [ibid., xi, p. 634] is endemic in South Russia on the weed *Setaria viridis*, and in wet years does considerable damage to Italian millet [*S. italica*], and should be carefully watched, as its potentialities as a parasite to maize are still obscure. The crop is also subject to attacks by bacteria, among which *Bacillus zeae* Burrill, *Aplanobacter stewarti* [ibid., xii, p. 78], and *Bacterium holci* [ibid., xi, p. 364] have definitely been recorded in Russia.

A bibliography comprising 159 titles is appended.

Smith (F. E. V.). **Citrus scab.**—*Journ. Jamaica Agric. Soc.*, xxxvi, 10, pp. 500–502, 1932.

While sour orange [*Citrus aurantium* var. *bigaradia*], Temple [hybrid] and King [*C. nobilis*] oranges, and lemon are susceptible

to scab [*Sporotrichum citri*: *R.A.M.*, xii, p. 21 and next abstract] in Jamaica, sweet orange [*C. sinensis*], grapefruit and shaddock [*C. decumana*], and almost all other kinds of citrus are highly resistant. In some nurseries of sour oranges intended as stocks, however, the effects of the disease are extremely serious, retarding the budding of the seedlings for twelve or eighteen months.

Scab being most severe in conditions of high humidity, it is essential that nurseries should be well drained and weeded, and remote from any old sour orange or lemon trees. A close and constant watch must be kept for the initial infection of the young shoots, as the evidence indicates that scab may be seed-borne. If the disease appears, all the diseased shoots should be cut off and burned at frequent intervals, this being followed at intervals of two to four weeks (according to the prevailing weather and the amount of new growth) by applications of Bordeaux mixture (4–4–40) or Burgundy mixture (4–5–40), preferably with the addition of about 1 per cent. miscible oil. If young growth is being made profusely the strength of the mixtures should be reduced by one quarter.

If the disease does not appear until the seedlings are almost ready for budding, it is often unnecessary to spray, as the scions are usually of resistant species of citrus and the disease is automatically controlled after the bud takes.

In conclusion emphasis is laid upon the necessity for choosing fresh land for every new nursery.

HENRICKSEN (H. C.). **Introductory notes to a study of Citrus scab. A study of Citrus scab. Some chemical differences in leaf tissue with reference to susceptibility to scab.**—*Agric. Notes, Porto Rico Agric. Exper. Stat., Mayaguez*, 62, 63, 7 pp., 1932. [Mimeographed.]

The following three possible methods of combating citrus scab [*Sporotrichum citri*: *R.A.M.*, x, p. 777 and preceding abstract] in Porto Rico are suggested: spraying or dusting with copper or sulphur, injection of chemicals into the trees, and the application of a potash fertilizer. Both spraying and dusting are open to various objections and give erratic results in the field; the technique of injection is not yet sufficiently developed to admit of a conclusion as to its practical value, while studies have been planned to determine the utility of potash in this connexion.

An investigation was made of the moisture, wax, oil, acid, plastid pigment, soluble carbohydrate and protein, and glucoside contents of old and young citrus leaf tissues with a view to ascertaining the reason of their relative susceptibility to scab. The wax, oil, and pigment contents were found to be higher in the old than in the young tissues, while moisture, carbohydrates, and proteins were more plentiful in the latter. A correlation between these data and scab infection is indicated.

LESTER-SMITH (W. C.). **Citrus mildew.**—*Phytopath.*, xxii, 10, p. 870, 1932.

In *Phytopath.*, ix, p. 266, [1919], a correction is made by T. Petch on a previous note (ibid., v, p. 350, [1915]), in which he states that

citrus mildew (*Oidium tingitaninum*) [*R.A.M.*, x, pp. 80, 786] does not occur in Ceylon on pomelo (*Citrus decumana*). A recent revision of the citrus species attacked by this mildew, however, shows that it occurs commonly in Ceylon on pomelo and grapefruit, as well as on sweet, mandarin, and sour oranges, lemons, and kalamondin orange (*C. mitis*). No perithecial stage of the fungus has yet been observed. Good control of the mildew may be obtained by weekly applications of certain lime-sulphur mixtures during warm, damp weather.

Green (F. Mary). **The infection of Oranges by Penicillium.**—*Journ. Pomol. and Hort. Science*, x, 3, pp. 184–215, 6 figs., 1932.

This is a detailed account of the author's investigation under controlled conditions of the mechanism of infection of orange fruits with blue and green moulds (*Penicillium italicum* and *P. digitatum*, respectively) [*R.A.M.*, xi, p. 366]. The inoculum used throughout the work was obtained from an original South African orange attacked by both fungi. Infection of oranges inoculated with a water suspension of the spores of either species through needle punctures of the surface succeeded only when the stabs went beyond the outer yellow rind or flavedo (which is a hard, compact tissue, containing no soluble pectin), and entered the inner white rind or albedo (a soft tissue, containing considerable quantities of soluble pectin). The depth of puncture necessary to obtain 100 per cent. infection appeared to be correlated with the degree of ripeness and the variety of the oranges. The addition of orange juice, rind extract, acids, or ammonium oxalate to the suspension promoted infection even through minute, shallow wounds in the outer rind alone. Superficially sound fruits could be infected without wounding only after the resistance of the outer rind was broken down by treatment with an acid or ammonium oxalate (which hydrolysed the insoluble pectic substances of the cell walls into soluble pectin), or by direct application to the surface of infective juice and rind from a recently rotted orange. Experiments showed that the resistance of the uninjured rind was not due to the presence of any growth-inhibiting substance and that its breaking down by acids was due to the action of the acid on the rind and not on the fungus.

These results are interpreted to indicate that the two species of *Penicillium*, when growing in orange juice and rind (but not in synthetic media), produce a system which destroys the resistance, considered to be mechanical in nature, of the outer rind of healthy fruit. The action of this system, while similar to that of acids in that it causes hydrolysis of the pectic substances of the cell walls, goes still further and brings about the dissolution of the walls, thus affording free entry to the fungi. Hydrogen-ion concentration was shown to be one factor in the resistance-destroying system produced by the organisms in a mouldy orange, since both this concentration and the infective power of mouldy rind decreased parallel with increasing age of the infected oranges. It is believed, however, that there is also another factor concerned, possibly enzymic in nature, which has not yet been determined.

GIOELLI (F.). **Fenomeni di antagonismo in 'Penicillium digitatum' (Pers.) Sacc. e 'Penicillium italicum' Weber in natura. (Nota preliminare).** [Phenomena of antagonism in *Penicillium digitatum* (Pers.) Sacc. and *Penicillium italicum* Weber in nature. (A preliminary note.)]—*Riv. Pat. Veg.*, xxii, 7–8, pp. 195–200, 3 figs., 1932.

While examining diseased oranges, lemons, and mandarins the author frequently observed fruits attacked both by *Penicillium digitatum* and *P. italicum* [see preceding abstract], the fungi showing evident signs of mutual antagonism. On lemons, especially, *P. digitatum* had often invaded the whole fruit and surrounded a small patch of *P. italicum*. When two wounds were made on lemons, one being inoculated with *P. italicum* and the other with *P. digitatum*, the latter quickly demonstrated its dominance; on many of the fruits a broad line of demarcation developed, but on others the mutual antagonism of the fungi set up morphological modifications, such as a copious aerial mycelium round the infected area.

BALLY (W.). **Geographische Verbreitung der Krankheiten des Kaffeebaumes.** [The geographical distribution of the diseases of the Coffee tree.]—*Verh. Schweiz. Naturforsch. Gesellsch.*, cxiii, p. 367, 1932.

Notes are given on the geographical distribution of a number of coffee diseases.

KADEN (O. F.). **Observations concerning the healthiness of Coffee trees in Costa Rica.**—*Trop. Agriculture*, ix, 11, pp. 350–351, 1932.

In noting the excellent general health of coffee plantations in Costa Rica, the author states that the only fungal diseases which were in evidence during his visit there in May [? 1932] were *Omphalia flavida* [*R.A.M.*, xi, pp. 283, 431], *Cercospora coffeicola* [ibid., xi, p. 283], and a species of *Rosellinia*, needing careful watching, which causes a kind of collar crack. In his opinion, *O. flavida* is not as dangerous as generally described in literature, in no way comparable with *Hemileia vastatrix* in the East; it chiefly occurs in places that are too damp, or on trees that are overcrowded and badly pruned; its prevention and control should present little difficulty.

The author also noticed in Costa Rica, particularly in the oldest cultivated districts, a non-parasitic disease of coffee, similar to one which he had observed the previous year in Angola (Portuguese West Africa); it is characterized by a drying of the branches, shedding of the leaves, and occasionally the death of the whole bush. Preliminary observations indicate that the trouble is brought about by some deficient environmental factor or factors, and is also favoured by unsuitable pruning. The affected bushes appear to suffer from some interference with their nutrition at the critical period of their growth during the dry season. The paper terminates with a brief discussion of the measures for the control of the disease.

GYDE (L. M.). **Some observations on the genus Hemileia.**—*S. African Journ. of Sci.*, xxix, pp. 296–300, 6 figs., 1932.

Hemileia occurs in many of the warmer parts of South Africa as a parasite of various Rubiaceous plants, including *Gardenia*, *Vangueria pygmaea*, and *V. infausta* [cf. *R.A.M.*, iv, p. 165; vi, p. 258; xi, p. 636], producing pale yellow to orange, later dark brown patches on the leaves, which wither and fall in severe cases.

Marked differences in the incidence of *H. vastatrix* were shown by a recent inspection of the plantations of two coffee growers in the Tzaneen district, one of which was entirely free from the rust, while about 40 per cent. of the foliage was attacked in the other. The healthy plantation is situated at an altitude of some 3,000 ft., the soil being clean of weeds, and cattle dung used for manuring; the infected garden is 1,000 ft. nearer sea level and was green-manured by digging in the abundant weeds. In both plantations papaw trees were used for shade.

Cross-inoculation experiments [the technique of which is indicated] were made with *Hemileia* between various Rubiaceae. On coffee the incubation period was about 30 days when the average maximum temperature was 85·9° and the average minimum 66·7° F. Apart from one doubtful case of transference from *Gardenia* to coffee, the only other successful cross-inoculations were from *V. pygmaea* to *V. infausta*. These results agree with those obtained by Pole Evans (*Ann. Rept. Transvaal Dept. Agric.*, p. 165, 1906–7), and fail to support Massee's contention that the establishment of coffee plantations in the vicinity of *Vangueria* would probably be disastrous.

The average dimensions of the uredospores on coffee were 35 by 25 μ, the corresponding figures for *V. infausta* and *V. pygmaea* being 32 by 23 and 27 by 15 μ, respectively. The time required for germination was six days for uredospores from coffee and three and seven, respectively, for those from *V. infausta* and *V. pygmaea*. The uredospores from *V. pygmaea* germinated in water and in 0·5 per cent. cane sugar. No germination occurred in a 2 per cent. lactic acid solution or in one of equal parts of 2 per cent. lactic acid and 0·5 per cent. cane sugar. A few teleutospores developed in the uredosori on *V. pygmaea*; one measured 17 by 15 μ as compared with 27·5 by 15 μ for a neighbouring uredospore. Inoculation of *V. pygmaea* with uredospores from *V. infausta* resulted in the production of sori with smaller uredospores than those on *V. infausta* but larger than those normally found on *V. pygmaea*.

PALM (B. T.). **Eriodendron as host of Bacterium malvacearum.**—*Phytopath.*, xxii, 10, pp. 867–868, 1932.

The well-known Mexican variety 'Pochote' of the kapok tree (*Eriodendron anfractuosum*) on the Pacific coast of Guatemala is stated to be subject to a fairly serious bacterial disease caused by *Bacterium malvacearum*, this being apparently the first record of the cotton parasite outside the genus *Gossypium* [but cf. *R.A.M.*, iii, p. 272].

The disease is most prevalent in seed-beds during the rainy season and affects both leaves and stems. The former show the

most conspicuous symptom, consisting of irregular spots surrounded by an oily, translucent halo. As the mesophyll is invaded it shrivels and turns dark brown. If the spots occur near the points of the digitate leaves little damage results, but if the base of the leaflets is infected defoliation soon follows. Infection is readily transmitted through the bud scales to the developing leaf, so that premature shedding ensues. Full grown leaves are infected almost exclusively on the upper surface, and the spread of the organism is so slow that a protective tissue can be generated in the mesophyll, thereby preventing the pathogen from penetrating through the thickness of the leaf. The petioles are also liable to infection from which defoliation invariably results.

On the infected stems of young plants oblong, brown lesions develop rapidly. The centres of the spots turn greyish with age, and the border zone may appear slightly raised owing to the extensive formation of wound cork. The lesions may remain superficial and cause little damage, but in wet weather, when the stem makes rapid growth, the xylem may be penetrated near the growing point, which is killed by the formation of a girdle of necrotic tissue round the main axis. One or more new shoots may then be repeatedly formed below the girdle, with the result that the entire habit of the tree is changed during the growing season to a stunted, irregular type of branching that renders it useless for planting. In infected horizontal branches of older trees, the new shoots formed below the growing point grow upwards at a right angle to the supporting branch.

Cross-inoculation experiments showed that *Bact. malvacearum* from cotton readily produced lesions of the above-mentioned type on *E. anfractuosum*, and vice versa.

Moore (M.). **Coccidioidal granuloma: a classification of the causative agent, Coccidioides immitis.**—*Ann. Missouri Bot. Gard.*, xix, 4, pp. 397–427, 1 pl., 1932.

The history, geographical distribution, and symptoms of coccidioidal granuloma are described, with a summary of the pathological conditions associated with the disease. Regarded at first as a protozoon under the name *Coccidioides*, the organism was subsequently referred to the fungi and assigned to the genera *Oidium*, *Myoderma*, *Torulosis*, *Blastomycoides* [*R.A.M.*, x, p. 104, and next abstract] by various workers. The author grew the causal organism from the spores liberated from the spherical bodies found in the tissues, and obtained a well-developed mycelium of septate cells irregular in size and shape and up to 4 μ broad. Arthrospore-like segments, up to 11 μ in diameter, are cut off and enlarge into spherical bodies, the asci, in which very numerous minute spores develop. These are liberated by a thinning of the wall and germinate by elongating into a germ-tube from which the septate mycelium develops.

After a full discussion of the systematic position of the fungus, the writer refers it to the Endomycetales, in which he establishes a new family, Coccidioideaceae, with *Coccidioides* as the chief genus represented by two species, *C. immitis* and *C. esferiformis* (syn. *C. brasiliensis*).

AGOSTINI (ANGELA). **Observations on fungi found in cases of North American blastomycosis of the skin and lungs.**—*Journ. Trop. Med. & Hygiene*, xxxv, 17, pp. 266–268, 2 figs., 1932.

The writer's studies of Prof. Castellani's cultures of *Blastomycoides* [*R.A.M.*, viii, p. 103], of which that on *B. lanuginosus* has already been completed [determined as *Glenospora lanuginosa*: ibid., xi, p. 106], have been extended to *B. immitis* [see preceding and next abstracts] and *B. tulanensis*, isolated from North American cases of blastomycosis of the skin and lungs. These fungi are renamed *Geotrichum immite* (Rixford & Gilchrist) Agostini and *Monosporium tulanense* (Castellani) Agostini, respectively, revised Latin diagnoses being given. *G. immite* forms white, pulverulent, flocculent colonies, later turning yellow, on agar. The hyphae measure 2 to 2·5 μ in diameter (later 3 to 5 μ) and are often joined in bundles; cylindrical arthroconidia are formed, 6 to 9 μ in length. There is also a racquet-shaped mycelium and irregular arthrospores, while large, cystiform chlamydospores, 8 to 15 μ in diameter, may also be observed. The optimum temperature for growth is 22° to 27° C., but development also takes place at 10° to 20°. Gelatine and serum are rapidly liquefied, glucose and maltose not fermented, and milk not coagulated.

M. tulanense also forms both slender (1 to 2 μ) and thicker (4 to 5 μ) hyphae, which are continuous or septate and branched; the oblong, piriform, or roundish conidia measure 5 to 7 by 3 to 5 μ, and round chlamydospores, 8 to 15 μ in diameter, also occur, sometimes in chains. The fungus grows at a temperature range of 10° to 27° (optimum 20° to 25°). Milk is not coagulated, nor serum nor gelatine liquefied.

CIFERRI (R.). **Sulla posizione sistematica del genere Coccidioides e di due generi affini.** [On the systematic position of the genus *Coccidioides* and of two related genera.]—*Arch. für Protistenkunde*, lxxviii, 2, pp. 238–262, 2 figs., 1932. [German summary.]

The life-history of *Coccidioides immitis* [see preceding abstracts] can be divided into two parts, namely, the saprophytic phase (hyphae-resting spores and resting spores-hyphae), and the parasitic (zoosporangia-zoospores and zoospores-zoosporangia). Under parasitic conditions the resting spores are transformed into zoosporangia, while in the saprophytic state the zoospores produce hyphae. As regards its systematic position the organism belongs to the Chytridineae [ibid., xi, p. 515], the genus *Coccidioides* being the sole representative of the new family Coccidiaceae which differs considerably from the Protomycetaceae.

The genus *Dermocystidium*, comprising *D. pusula* on *Triton marmoratus* and *D. branchialis* on *Trutta fario*, is referred to the Olpidiaceae, while the related genus *Rhinosporidium* (*R. seeberi*) [ibid., xi, p. 641] is placed in a special family, the Rhinosporidiaceae.

A bibliography of nearly fifty titles is appended.

Bennett (S. C. J.). **Epizootic lymphangitis: mycelial forms of the parasite in a natural case.**—*Journ. Compar. Path. & Therapeutics*, xlv, 2, pp. 158–160, 3 figs., 1932.

A brief account is given of the occurrence of mycelial forms of *Cryptococcus farcinimosus* [*R.A.M.*, xi, p. 641] in a spontaneous case of epizootic lymphangitis in a horse in the Sudan. This is believed to be the first record of the mycelial stage of the fungus in living tissues as opposed to artificial cultures.

[In an editorial footnote it is stated that short hyphae in pus from lesions were described by Tokishige in Japan.]

Keating (P. M.). **Fungus infection of bone and joint.**—*Southern Med. Journ.*, xxv, 10, pp. 1072–1078, 1932.

A species of *Monilia* [*Candida*], probably *albicans* [*R.A.M.*, xi, p. 373], was isolated from a number of cases of bone and joint diseases in Texas, including chronic polyarthritis, osteitis of the vertebral bodies, sacrum, and ilium, osteochondritis, and Paget's disease. Iodide therapy gave beneficial results in the majority of cases. Inoculation experiments on guinea-pigs were positive. The paper is followed by a discussion.

Manson-Bahr (P.). **Trichosporon beigeli parasitic on human hair from Nigeria.**—*Trans. Roy. Soc. Trop. Med. & Hyg.*, xxvi, 1, p. 9, 1932.

Trichosporon [*Trichosporum*] *beigeli* [*R.A.M.*, v, p. 363] was isolated from the pubic hairs of a patient at Sokotu, northern Nigeria. The fungus produces on the hairs irregular nodosities containing fungal elements, 3 to 5 μ in length. In culture a mycelium develops bearing arthrospores giving rise to blastospores, and in older cultures to ascospores [cf. ibid., vii, p. 783; viii, p. 241: ix, p. 35]. *T. beigeli* is stated to have been first discovered in London by Beigel in 1862, and is of occasional occurrence in Europe, though much more common in Central Africa and Japan. The beard and moustache may also be involved.

Baudet (E. A. R. F.). **Recherches expérimentales sur les Trichophyton animaux à cultures faviformes.** [Experimental studies on species of *Trichophyton* with faviform cultures, isolated from animals.]—*Ann. de Parasitol. Humaine et Comp.*, x, 6, pp. 520–541, 7 pl., 3 figs., 1932.

In the experiments described in this paper the author used five megasporous strains of *Trichophyton*, three of which were isolated from cows, one from a horse, and one from a goat. When grown on glucose agar, these strains produced typical faviform cultures, but occasionally subcultures on the same medium, especially at 25° C., developed a slight, short down which disappeared at the slightest contact with a platinum wire. When grown, however, on an agar medium prepared with a killed culture in bacteriological broth of a species of *Staphylococcus* of human origin [cf. *R.A.M.*, xi, p. 516], the *Trichophyton* strains produced a well-defined aerial sporiferous apparatus with aleuriae, a similar growth being also produced on potato and carrot, and on oleic acid agar. In the author's opinion these observations indicate that the term

'faviform' will have eventually to disappear from the nomenclature of species of *Trichophyton* originating from animals, since he considers that the glabrous character of the cultures is only due to the growth of these fungi on media unfavourable for their development.

Puntoni (V.) & Pampana (E. J.). **A copper-coloured variety of caraate caused by Trichophyton megnini (Tr. rosaceum.)**—*Journ. Trop. Med. & Hygiene*, xxxv, 10, pp. 154–156, 1932.

After a brief review of the previous literature relating to the desquamating dermatomycosis known as 'caraate' or 'carate' ('pinta') in South America, the writers report a case of this disorder with predominantly brownish-coppery spots in a negro in Colombia.

The fungus isolated from the majority of the lesions was characterized by a branched mycelium, often with terminal or lateral aleuria, arranged in simple bunches at the ends of the hyphae. On Sabouraud's medium the colonies were velvety-white at first, later turning pink on the surface and dark violet at the back, with radial folds. A pleomorphic variant of the organism developed snow-white, velvety, plurisulcated colonies with a faint pink pigmentation at the back, later turning blackish and assuming an irregular shape. The fungus was identified as *Trichophyton megnini* (*T. rosaceum*) [*R.A.M.*, xi, p. 783].

Species of *Penicillium* and *Aspergillus* were sometimes associated with *T. rosaceum* in the lesions, but their etiological role is doubtful.

Lourier (A. G.) & Reiff (M. G.). **Un cas de favus généralisé de la peau avec présence d'"Achorion schoenleini" dans les cultures du sang et du suc des glandes lymphatiques.** [A case of generalized favus of the skin with the presence of *Achorion schoenleini* in cultures of the blood and fluid of the lymphatic glands.]—*Ann. de Dermatol.*, Sér. VII, iii, 10, pp. 912–916, 2 figs., 1932.

Since the war there has been a steady increase in the incidence of dermatomycoses in Russia as in other parts of Europe, and some of these disorders formerly regarded as rarities are now of common occurrence. A note is here presented on the development in a 14-year-old girl of generalized favus of the scalp and body due to *Achorion schoenleini*, which was obtained in pure culture not only from the skin, hair, and nails, but also from the blood and the fluid of the submaxillary glands.

Towey (J. W.), Sweany (H. C.), & Huron (W. H.). **Severe bronchial asthma apparently due to fungous spores found in Maple bark.**—*Journ. Amer. Med. Assoc.*, xcix, 6, pp. 453–459, 7 figs., 1932.

Details are given of a clinical, roentgen, and laboratory study carried out on a series of 35 patients in the Upper Peninsula of Michigan showing typically asthmatic symptoms, including dyspnoea, cough, loss of weight, and fever. It was found on investigation that the men were working in railway and motor plants where they came into contact with dust from maple [*Acer*

sp.] logs cut for over a year. The dust was found on analysis to contain the spores of a fungus identified at the Wisconsin Forest Products Laboratory as *Coniosporium corticale*, which is reported to have occurred recently on dying maples, hickories [*Hicoria* spp.], and basswoods [*Tilia* spp.] in Wisconsin. Extracts of the spores produced local skin reactions in the affected group, as also did a suspension of macerated spores, while control tests gave negative results. The condition under discussion is tentatively attributed to a local toxic effect and foreign body reaction combined with a delayed effect resembling protein sensitization in its clinical and certain immunological aspects. The spores of *C. corticale* caused a sensitization, following parenteral administration to guinea-pigs, which was pathologically related to anaphylaxis. The first definite spore asthma in human beings is stated to have been reported by F. T. Cadham, of the University of Manitoba (*Journ. Amer. Med. Assoc.*, lxxxiii, 5th July, 1924), who investigated the condition in three harvest hands sensitized by the wheat rust (*Puccinia graminis*).

Ciferri (R.). **Cephalosporium pseudofermentum n. sp. isolato dalla bocca dell'uomo.** [*Cephalosporium pseudofermentum* n. sp. isolated from the mouth of man.]—*Arch. für Protistenkunde*, lxxviii, 2, pp. 227–237, 1 pl., 2 figs., 1932. [German summary.]

Cephalosporium pseudofermentum n. sp. was isolated in 1929 from the mouth of a white student on the island of Moca, Antilles, suffering from an obscure gastro-enteric malady of the 'sprue' type. The fungus [a Latin diagnosis of which is given, together with an amended description of the genus and taxonomic notes] forms pale, later pink colonies on agar, with a hyaline, densely branched, septate mycelium, 1·5 to 2·5 μ in diameter; intercalary or more rarely apical, single or 3- to 4-catenulate, cylindrical or spherical chlamydospores, budding profusely, the single cells measuring 3 to 7 by 2·5 to 4, average 3·6 by 3 to 3·5 μ; and cylindrical, elliptical, ovoid or reniform conidia with rounded or acuminate apices, 3 to 5 by 1·5 to 2·5 μ, borne in clusters of 20 to 50, or more rarely up to 100 or more, in heads 5 to 45 μ (mostly 10 to 20 μ) in diameter, at the apex of more or less distinct conidiophores.

Tilford (P. E.). **Diseases of ornamental plants.**—*Ohio Agric. Exper. Stat. Bull.* 511, 82 pp., 34 figs., 1932.

Popular notes are given on the symptoms, etiology, and control of the fungous, bacterial, and physiological diseases affecting ornamental plants in Ohio.

Sirag-el-Din (A.). **Simple cures for Rose diseases.**—*Min. of Agric. Egypt Mycol. Res. Div.* (*Plant Protect. Sect.*) *Leaflet* 18, 4 pp., 2 col. pl., 2 figs., 1932.

Popular notes are given on the symptoms, etiology, and control of rose mildew and rust (*Sphaerotheca pannosa* and *Phragmidium mucronatum*) [*R.A.M.*, xi, p. 694], respectively, in Egypt. Against the former disease two applications of a 1·5 per cent. soda and

soap solution (15 gm. soda, 5 gm. soap, and 1 l. water) are recommended for use when there are no leaves on the bushes (early in February and early in September) or 0·75 per cent. (half the above quantity of soda) at other times; while rust may be controlled by spraying with 1 per cent. copper sulphate when there are no leaves on the bushes, in addition to destroying all diseased leaves.

Goetz (O.) & Winkelmann (A.). **Der Schwefelvernebelungsapparat 'Sulfurator.'** [The sulphur vaporization apparatus 'Sulfurator'.]—*Blumen- und Pflanzenbau*, xlvii, 10, pp. 152–153, 1 fig., 1932.

Further details are given of the construction and use of the Sulfurator sulphur vaporization apparatus [*R.A.M.*, xi, p. 254; xii, p. 62], especially against the mildews of roses [*Sphaerotheca pannosa*] and other plants [see preceding and next abstracts]. In addition to the large and small types already described, a medium-sized apparatus is now available, holding 1,500 gm. sulphur and weighing 18 kg. In experiments with the large apparatus greenhouses of 25,000 cu. m. were treated in 2 to 2½ hours, 6 kg. sulphur sufficing for 10,000 cu. m.

Hahmann (C.). **Schwefelnebel im Gewachshaus.** [Sulphur mist in the greenhouse.]—*Blumen- und Pflanzenbau*, xlvii, 10, p. 151, 1932.

Excellent control of hydrangea mildew (*Oidium hortensiae*) [*R.A.M.*, x, p. 32] is stated to have been obtained in a greenhouse of 1,600 cu. m. at Berne, Switzerland, by the use of Rupprecht's Sulfurator sulphur vaporization apparatus [see preceding abstract]. The apparatus filled the greenhouse with a thick mist in about ten minutes, and after two hours a thin layer of sulphur could be detected all over the plants, as well as on the ground and elsewhere.

Wager (V. A.). **Aster wilt in South Africa.**—*S. African Journ. of Sci.*, xxix, pp. 301–312, 1932.

Aster (*Callistephus chinensis*) wilt is stated to be spreading to an alarming extent in South Africa. In Pretoria, for instance, these flowers can no longer be grown in a large number of gardens. The typical symptoms of the disease appear when the plants are a foot or more in height, when they wilt suddenly, the leaves turning first yellow and then brown and curling up, while the stem and branches remain erect. A black streak usually appears on one side of the stem, sometimes extending from soil level to the tip. *Fusarium conglutinans* var. *majus* (determined by Wollenweber) was isolated both from the interior of diseased stems and from the pink spore masses developing on the surface, and inoculation experiments showed it to be a virulent pathogen of asters. This is apparently the first record of the pathogenicity of this variety, aster wilt in other countries being due to *F. conglutinans* var. *callistephi* [*R.A.M.*, xii, p. 79], which was not encountered by the writer.

Sclerotium rolfsii, *Rhizoctonia* [*Corticium*] *solani*, and *Pythium ultimum* [ibid., xi, pp. 331, 408] were also isolated from young

wilting asters, and the two latter were shown by inoculation tests to be capable of killing the plants. Probably they would only be dangerous, however, in the early stages of growth. *S. rolfsii* was unable to induce wilt artificially. *F. conglutinans* var. *majus* was not found attacking any other plant. It grew best at a temperature of about 80° F.

Asters were grown for inoculation in soils of varying hydrogen-ion concentrations, and wilt was found to develop progressively as the acidity increased, whereas on the alkaline side of neutrality wilting decreased. The incidence of the disease, however, was not appreciably influenced by the application of agricultural lime up to 10,000 lb. per acre on soil with an initial P_H of 7·1, nor was infection arrested by soil treatments with uspulun, copper sulphate, mercuric chloride, Cheshunt compound, or potassium permanganate.

A number of aster varieties that have proved resistant to *F. conglutinans* var. *callistephi* were grown in heavily infected soil in Pretoria and developed an average of 47 per cent. wilt, compared with 100 per cent. in the local variety used as a control. The use of such semi-resistant varieties appears to offer the best hope of control.

Tasugi (H.) & Kumazawa (M.). **Phytophthora blight of Peony. (Studies on Japanese Peronosporales, I.)**—*Journ. Imper. Agric. Exper. Stat.*, Nisigahara, Tokyo, ii, 1, pp. 75–96, 3 pl., 3 graphs, 1932. [Japanese, with English summary.]

Peony (*Paeonia albiflora*) plants at the Nisigahara Agricultural Experiment Station were observed, in May, 1929, to be suffering from a leaf, stem, and bud blight, the affected parts being greyish-brown or black and somewhat leathery. The diseased tissue was found to contain an intercellular mycelium sending small, spherical haustoria into the host cells.

A species of *Phytophthora* was constantly isolated from the infected material, characterized by ovoid, hyaline sporangia with broad apical papillae, borne in groups of 1 to 13 (usually 3 to 5) on the sporangiophores and measuring 18·2 to 36·4 by 14·5 to 29·1 μ (average 26·3 by 21·9 μ), papilla 3·6 to 7·3 by 1·8 to 7·3 μ (4·9 by 3·3 μ). The zoospores are 5·5 to 7·2 μ in diameter after coming to rest. The spherical oogonia measure 24·5 to 40 μ in diameter (average 31·8 μ) and the ellipsoidal or reniform, amphigynous or paragynous antheridia, 9·1 to 14·5 by 6·4 to 14·5 μ (11·5 by 9·7 μ). The brown, globose, thick-walled oospores, 21 to 36·4 μ in diameter (average 28·2 μ), germinate directly by a germ-tube. The intercalary or terminal, spherical chlamydospores measure 18·2 to 42·7 μ (30·6 μ) and produce germ-tubes giving rise either to new chlamydospores or to sporangia.

The fungus grew best on bean, potato, oatmeal, and maize meal agars, the minimum, optimum, and maximum temperatures for development being 4·5°, 23°, and 33° C., respectively. The most favourable hydrogen-ion concentration was P_H 5·5 to 6·4.

Inoculation experiments with the *Phytophthora* on healthy peonies and tree-peonies (*Paeonia moutan*) gave positive results, while the leaves and stems of tomato also contracted infection.

A comparison of the Japanese peony *Phytophthora* with *P. paeoniae*, *P. infestans*, and *P. thalictri* revealed its identity with the first-named [ibid., x, p. 755].

PALM (B. T.). **A note on Entyloma dahliae Syd. from Sumatra and Guatemala.**—*Phytopath.*, xxii, 10, pp. 868–869, 1932.

During 1924 and 1925 dahlias growing in elevated situations in Sumatra were observed to be severely attacked by *Entyloma dahliae* [*R.A.M.*, xii, p. 26]. The plant material had all been imported from Holland, where the disease must evidently be fairly widespread. On a recent visit to Guatemala, where the dahlia is indigenous, the writer also detected *E. dahliae* on *Dahlia coccinea*, one of the ancestors of the cultivated dahlia, while *D. excelsa* was apparently immune. It is believed that recent importations of the former species into botanical gardens and similar establishments in Europe for crossing purposes may account for the distribution of the fungus in that continent.

GUYOT (A. L.). **Au sujet du mode d'hivernation de certaines Urédinées parasites des Graminées.** [On the mode of overwintering of some Uredinaceae parasitic on Gramineae.]—*Rev. Path. Vég. et Ent. Agric.*, xix, 6–7, pp. 186–190, 1932.

In this brief note the author discusses, on the ground of personal observations in France and of data in literature, the overwintering of *Puccinia coronata* [*P. lolii*] on *Lolium perenne* and other grasses, *P. glumarum* on *Dactylis glomerata*, and *P. bromina* on *Bromus sterilis* in the form of latent mycelium which persists in the host plant even through periods of great cold (−7° to −9° C.), and can form uredosori when the temperature again becomes favourable for its development.

WEIMER (J. L.) & MADSON (B. A.). **Alfalfa diseases in California.**—*California Agric. Exper. Stat. Circ.* 326, 19 pp., 7 figs., 1932.

The writers here summarize in popular form the available information on the following diseases affecting lucerne in California: bacterial wilt (*Phytomonas insidiosa*) [*Aplanobacter insidiosum*: *R.A.M.*, xi, p. 787], dwarf [ibid., x, p. 388], rust (*Uromyces medicaginis*), leaf spot (*Pseudopeziza medicaginis*), yellow leaf blotch (*Pyrenopeziza medicaginis*) [ibid., ix, p. 187], downy mildew (*Peronospora trifoliorum*) [ibid., xi, p. 304], bacterial blight (*Phytomonas* [*Bacterium*] *medicaginis*) [ibid., xi, p. 18], and crown wart (*Urophlyctis alfalfae*) [ibid., vii, p. 619].

THOMAS (P. H.) & RAPHAEL (T. D.). **The composition, application, and general effects of the main orchard sprays at present applied to pome fruits.**—*Tasmanian Journ. of Agric.*, iii, 4, pp. 145–153, 4 figs., 1932.

In this paper the authors briefly describe the composition and application of the main sprays used in Tasmania in the commercial control of fungal diseases and insect pests of pomaceous fruit trees, and give a few observations on their general effect both on the parasites and the hosts.

KRAATZ (W. H.). **Formalingas zur Bekämpfung der Erkrankung von Früchten auf dem Lager.** [Formalin gas for the control of fruit diseases in storage.]—*Obst- und Gemüsebau*, lxxviii, 10, p. 160, 1932.

The writer has obtained excellent control of the storage diseases of fruit, caused by various [unspecified] fungi, by fumigation of the storage room with formalin gas pastilles supplied by the Chemische Fabriken Schering-Kahlbaum A.-G., Berlin N. 65, Müllerstr. 170–171. Each pastille generates, on heating in a special apparatus provided with a small spirit lamp (Hygiea or Aesculap, obtainable from the above-mentioned firm), 1 gm. of 100 per cent. pure formalin gas, and one to two tablets are required per cu. m. of space. The process of fumigation occupies some seven hours, but it is advisable to keep the room closed for two to three days. The operation may be repeated if necessary after six to eight weeks.

WIESMANN (R.). **Untersuchungen über die Ueberwinterung des Apfelschorfpilzes Fusicladium dendriticum (Wallr.) Fckl. im toten Blatt, sowie die Ausbreitung der Sommersporen (Konidien) des Apfelschorfpilzes.** [Investigations on the overwintering of the Apple scab fungus *Fusicladium dendriticum* (Wallr.) Fckl. in the dead leaf, and on the dissemination of the summer spores (conidia) of the Apple scab fungus.]—*Landw. Jahrb. der Schweiz*, xlvi, 5, pp. 620–679, 13 figs., 6 graphs, 1932.

After a brief reference to the importance of the perfect stage in the overwintering of apple scab (*Venturia inaequalis*) [*R.A.M.*, xii, pp. 32, 102], the author's studies on the biology of the fungus, carried out at the Wädenswil Experiment Station, are reported in detail.

Perithecial maturation was found to depend in the first instance on a sufficiency of moisture, being accelerated by alternating wet and dry periods [cf. ibid., vi, p. 299; xi, pp. 112, 309, *et passim*]. Temperature is also important, the optimum for ascus and ascospore formation in Virginian Rose apple leaves being 17° C., with a minimum just above 0° and maximum at 29°. Good development occurred throughout the range from 13° to 21°. The ascospores survived 48 hours' exposure to a temperature of 32°. The time of perithecial maturation was further found to vary according to the period of autumn leaf fall, and in different varieties. The interplay of all these factors determines the actual date of the primary spring infection, on which in turn the extent of the scab injury largely depends. Thus, if primary infection by means of the ascospores occurs early in the spring (before blossoming), an epidemic is more likely to follow than in the case of relatively late attacks, when the foliage has developed a certain amount of resistance. This observation was exemplified in the experimental garden in 1931, when the Virginian Rose and Gravenstein varieties were infected before 1st May and suffered heavily from scab, while Wellington Reinette and Boiken were not attacked until the leaves had acquired a high degree of resistance during the warm, dry weather in May, and were consequently little affected.

Kept under dry conditions in the laboratory, the ascospores

of *V. inaequalis* were found to remain viable for considerable periods, a small percentage germinating after 38 days. Under dry conditions in the open the ascospores retained their viability for nearly five months. Spore trap experiments in 1931 showed that the apple scab ascospores were present in the air from the beginning of April to the middle of June, the above-mentioned primary infections being probably attributable to this source. Free ascospores could, however, only be trapped during or immediately after rain.

American workers have shown that wind, in the absence of rain, is ineffectual as an agent in the dissemination of conidia of *V. inaequalis*, and this observation was confirmed by the writer's tests, in which artificially induced velocities of 300 to 500 m. per sec. were necessary to detach any large number of the conidia from the leaves, a process readily effected by dropping water. This is far above velocities found in nature and it may be assumed that the conidia serve mainly for the dissemination of infection within a single tree. It was shown incidentally that the spores of certain other fungi, e.g., *Cladosporium fulvum* on tomato and *Monilia* [*Sclerotinia*] *fructigena* on apple, are detached by a wind velocity of 60 m. per sec.

BRIEN (R. M.). **'Delicious spot' on Apples due to Gloeosporium perennans.**—*New Zealand Journ. of Agric.*, xlv, 4, pp. 215–218, 2 figs., 1932.

Extensive investigation in 1930 and 1931 of the apple storage rot which was first recorded in New Zealand in 1923 by Cunningham under the name of 'Delicious spot' [*R.A.M.*, iv, p. 673], as it occurred most commonly on the variety Delicious, showed that it is caused by *Gloeosporium perennans* [ibid., x, p. 674; xi, p. 788], a brief English diagnosis of which is appended. The fungus is stated to agree closely with cultures received from Zeller in the United States. In New Zealand the rot appears to occur in all cool stores throughout the Dominion, chiefly on the varieties Delicious and Sturmer, and to a lesser extent on Rokewood, Statesman, and Washington. Observations in nature, confirmed by laboratory tests, indicate that infection usually takes place through mechanical injuries and necrotic areas resulting from sun or spray scorch and the like; under favourable conditions, however, the fungus can enter through the lenticels, and may then cause numerous lesions scattered all over the surface of the fruit. Besides the varieties named above, inoculations also produced typical rot in Jonathan and Cox's Orange apples.

TILLER (L. W.). **A superficial spotting disease of the Lord Wolseley Apple.**—*New Zealand Journ. of Sci. & Techn.*, xiv, 2, pp. 111–113, 1 fig., 1932.

In 1928 attention was drawn by Dr. Barker, of the Cambridge Low Temperature Research Station, to the occurrence of a scald-like spotting on New Zealand Lord Wolseley apples purchased in England. The spots are yellowish-brown at first, later turning to a buckthorn-brown or ochraceous-tawny, and finally assuming a Dresden or cinnamon-brown tinge (Ridgway's Color Standards).

The lesions are generally situated at the lenticels, and they gradually enlarge and become slightly sunken. The diseased areas are very susceptible to fungous invasion.

It was found that late picked (31st March) fruit is much more susceptible to the spotting than that gathered earlier (8th), while storage at 32° F. reduced the amount of injury as compared with 38°. The use of oiled wrapping paper did not give sufficient control to justify the expense of this treatment.

The disturbance, which is generally more severe at the stalk than at the calyx end of the apple, was found to be a photochemical effect following exposure to sunshine. It did not occur among fruit kept in a container from which light was excluded. Other varieties developing this form of spotting under similar conditions were Granny Smith, Cleopatra, and London Pippin.

SMITH (R. E.). **The diamond canker disease of the French Prune in California.**—*California Agric. Extens. Serv. Circ.* 67, 22 pp., 14 figs., 1932.

The macroscopic symptoms of diamond canker of French (Agen) prunes in California [*R.A.M.*, xii, p. 79] consist of a marked thickening of the bark on the trunk and main limbs. The diseased cortex is rough, black, and corky, with a tendency to split both length- and cross-wise, especially at the twig bases and over pruning cuts, resulting in the typical diamond-shaped cankers. Once a tree is affected the disease usually spreads right through it, proceeding regularly upwards on the limbs in such a way as to suggest systemic infection, a theory confirmed by the development of characteristic symptoms on the suckers arising from the cankered forks. Towards the tips of these suckers the superficial bark layers show a longitudinal purplish streaking and a tendency to flake off. Old trees sometimes show a kind of perennial canker. Infection appears to originate in wound-healing tissue. The only organism consistently isolated from diseased trees during the last five years is *Dematium pullulans*. Inoculation experiments with cultures of this organism have given negative results, but in one case the inoculation of a pruning cut with a slice of diseased bark was followed after two years by the appearance of typical diamond canker.

Control measures should be directed towards the prevention of wounds, sunburn, and bacterial gummosis [ibid., viii, p. 550; ix, p. 598] by covering the trunks with a heavy coating of Bordeaux mixture or whitewash. Top-grafting with myrobalan [*Prunus divaricata*] sprouts has sometimes given good results, and temporary benefit may be derived by the excision of cankers and disinfection with mercuric chloride or Bordeaux paste, as well as by scraping off the rough outer bark and painting the exposed limbs with Bordeaux mixture or copper carbonate solution.

PFEIFFER. **Von den Sorgen der Gummierkrankung unserer Kirschbäume.** [Precautions against gummosis of our Cherry trees.]—*Zeitschr. für Obst-, Wein- und Gartenbau*, lviii, 10, pp. 203–205, 1932.

The writer's extensive observations on gummosis of cherry,

plum, peach, and apricot trees in Saxony indicate that the disease, in its local form, is attributable rather to unfavourable cultural conditions (e.g., heavy clay soils) than to bacterial invasion, though isolated cases of the latter do occur [cf. *R.A.M.*, viii, p. 182 *et passim*]. The remedy, in his opinion, lies in liberal applications of lime, which prevent the accumulation of oxalic acid in the trees with the consequent dissolution of the wood fibres and exudation of gum through the cortex.

Voglino (P.). **Sopra un grave deperimento delle foglie di Nespolo.** [On a serious leaf wilt of Medlars.]—*La Difesa delle Piante*, ix, 5, pp. 69–70, 1932.

At the end of August, 1932, numerous medlar trees (*Mespilus germanica*) in the vicinity of Susa, north Italy, became attacked first by *Entomosporium mespili* [*Fabraea maculata*] [*R.A.M.*, vi, p. 528] and subsequently by *Phyllactinia suffulta* [*P. corylea*: ibid., x, p. 343], the double attack producing a leaf wilt which became progressively worse and checked the development of the last fruits. Other medlars growing under identical conditions but sprayed in June and July with Bordeaux mixture were but slightly attacked and bore a normal crop.

Hockenyos (G. L.) & Irwin (G. R.). **Studies on Bordeaux deposition.**—*Phytopath.*, xxii, 10, pp. 857–860, 1932.

A tabulated account is given of the laboratory studies conducted at Urbana, Illinois, to ascertain the effect of a wetting agent on the uniformity of the deposit of 4–4–50 Bordeaux mixture on the leaf surface, and on the total deposit per unit area.

The apparatus used in spraying the leaves (cherry) was a Hudson hand sprayer operated by 10 lb. air pressure. The spray was directed against a perpendicular board to which the leaf to be sprayed was fastened. The period of exposure of the leaf to the spray was regulated by a pendulum-shutter, each swing corresponding to two seconds. After spraying the leaves were dried and sections cut from them and analysed for copper by the method previously described [*R.A.M.*, x, p. 475].

The amount of copper per sq. in. on a leaf sprayed for 12 seconds at a distance of 13 in. with Bordeaux mixture without a wetting agent was found to be 0·00011 gm., the corresponding figures for 16, 20, and 24 seconds being 0·00020, 0·00015, and 0·00010 gm., respectively. The run-off thus began at 20 seconds.

In a second test on apple leaves (11 in. distant) Bordeaux mixture alone was compared with the same plus 0·04 per cent. dried-blood albumin as a wetting agent. It was found that the latter, while not decreasing the amount of copper deposited, did eliminate the formation of heavy spots and to some extent augmented the uniformity of the deposit. The amount of copper per sq. in. ranged from 0·00009 to 0·00011 gm., run-off beginning in 6 seconds. In a further experiment on peach leaves it was shown that the under surface is capable of holding roughly twice as much copper as the upper, and that the various wetting agents employed

(1 per cent. colloidal clay, 0·5 per cent. soap, 0·125 per cent. kayso, gum ghetti, or waste pulp liquor, and 0·05 blood albumin) produced little effect on the amount of copper deposited. The times required for complete wetting of the leaves by Bordeaux mixture alone ranged from 5 to 45 seconds, the corresponding figures for the same plus the best wetting agents (soap, blood albumin, and kayso) being 4 to 5, 6 to 7, and 5 to 9 seconds, respectively.

It may be inferred from the data given above that the addition of wetting agents to Bordeaux mixture will somewhat increase the uniformity of the deposit and prevent the formation of heavy spots without diminishing the quantity of copper deposited per unit area.

De Ong (E. R.). **Fungicidal value of pine-tar oil and copper resinate.**—*Phytopath.*, xxii, 10, pp. 861–864, 1932.

Petroleum oil is a valuable insecticide but its lack of fungicidal efficacy has hitherto been a serious drawback where a combined oil-fungicidal spray is required. During the past four years research has been carried out on an oil known as palustrex, distilled from the pine tree and specifically adapted for use as a spray on plants. This preparation is a more active fungicide than the petroleum fractions used for foliage spraying, and is, moreover, an active solvent for copper resinate. A copper resinate solution in oil can thus be prepared.

Field tests of the copper-oil sprays have confirmed laboratory data by showing the superior efficacy of these preparations to Bordeaux mixture in the control of walnut blight [*Bacterium juglandis*: *R.A.M.*, xi, p. 772] and cantaloupe mildew (*Erysiphe cichoracearum*) [ibid., x, p. 702]. In a laboratory test of the comparative toxicity of copper resinate and copper sulphate to the spores of *Monilia* [*Sclerotinia*] and *Botrytis*, the latter was found to be slightly more effective, but the physical superiority of the oil-soluble spray (lower surface tension, increased penetration, and wax-dissolving capacity) could not be taken advantage of under the conditions used in the test. Copper resinate contains 9·5 per cent. metallic copper as against 25·4 per cent. in Bordeaux mixture, the low content being a further advantage from the standpoint of metallic residues on fruit and vegetables. The very light and somewhat sticky consistency of copper resinate renders it difficult to mix with oil, so a paste is now being put on the market containing 70 per cent. of the salt dissolved in palustrex.

Bondartzeff (A. S.). Болезни культурных растений и меры борьбы с ними. [Diseases of cultivated plants and their control.]—vii + 600 pp., 490 figs., 3rd revised and augmented ed., State Publishing Office of Agric. & Collective Farming Co-operative Literature, Leningrad, 1931. [Received December, 1932.]

This is a comprehensive text-book, designed chiefly for Russian advanced students in phytopathology, dealing with the chief physiological, bacterial, fungal, and virus diseases of cultivated crops and forest trees, with particular reference to those that occur in

the Russian Soviet Republics. A large proportion of the figures are original. Considerable space is given to recent attainments in the control of the diseases, and the book terminates with a list of the more important parasitic organisms, grouped under the Russian common names of the hosts, and with the indication of the main symptoms caused by them.

LAING (E. V.). **Studies on tree roots.**—*Forestry Comm. Bull.* 13, 73 pp., 17 pl., 2 figs., 5 diags., 1 graph, 1932.

Following an introductory description of the root system of a conifer and an account of the mycorrhiza on various genera, with notes on the associated fungi, the author discusses the soil conditions affecting the occurrence and distribution of mycorrhiza in Great Britain. An essential condition for mycorrhizal formation by first-year Scots pine (*Pinus sylvestris*) seedlings is that the ground used for the seed should have recently been under some kind of tree. This is exemplified by the poor growth of pine and also of larch seedlings in new nurseries formerly used for agricultural purposes. Isolated cases of mycorrhizal formation do occur, however, in such nurseries, and it has been observed that the seedlings with fungus (usually *Cortinarius mucosus* on Scots pine and larch) roots are much more vigorous than the others.

The production of mycorrhiza is liable to be inhibited in the poorer types of peat soil; and here again only the individuals with fungus roots are able to thrive. Mycorrhizal formation was not observed in peat of the *Calluna-Eriophorum-Erica* type except where the fungus was brought into contact with the tree roots. It has been found, however, that even in poor types of peat fungus roots may be formed following the admixture with the soil of oxidizing inorganic salts, especially magnesium carbonate, or fertilizers such as basic slag.

Evidence is available that the production of mycorrhiza also depends to a certain extent on the condition of the plant. Fungus roots are uniformly found on the more vigorous plants in all soils. Mycorrhiza are never formed on trees growing in water or in very wet peats; they occur only in those peat soils undergoing rapid oxidation, and wherever there is aeration of the peat, mycorrhiza will appear. No direct connexion was traced between the presence or absence of mineral bases in the peat solution and the formation of mycorrhiza. Where aeration occurs without the presence of mineral bases the 'ball' type of ectotrophic mycorrhiza is represented, the 'coralloid' type resulting from a combination of aeration and mineral bases.

It was apparent from the author's observations that the most successful tree growth in peat soils occurs where there is an equal proportion of 'fungus' and ordinary roots. In certain peat soils the mycorrhizal fungus may retard the longitudinal growth of the sub-lateral roots, while under adverse conditions the organism may assume a parasitic form and destroy the roots of the trees with which it is associated.

The bearing of these observations on the growing of conifers in peat and other classes of soils is discussed.

Chona (B. L.). **Studies in the physiology of parasitism. XIII. An analysis of the factors underlying specialization of parasitism, with special reference to certain fungi parasitic on Apple and Potato.**—*Ann. of Botany*, xlvi, 184, pp. 1033–1050, 2 graphs, 1932.

This is a detailed account of the author's experiments [conducted on the same lines as those of Vasudeva: *R.A.M.*, ix, pp. 545, 798], in which he tested the behaviour on apples and potatoes of three fungi normally parasitic on the potato, namely, *Fusarium coeruleum* [ibid., x, p. 795; xi, p. 669], *Phytophthora erythroseptica* [see above, p. 141], and a species of *Pythium* (? *de Baryanum*), and of two fungi normally parasitic on apples, namely, *Botrytis cinerea*, and two strains of *Fusarium fructigenum* [ibid., xi, p. 306] (strains D and Biii, the latter of which was very weakly parasitic). The results showed that under normal conditions the potato parasites were unable to attack apple tissue, and the apple fungi did not rot the potatoes, but when a source of nitrogen was added to the inoculum *F. coeruleum* was able to invade apple tissues to a certain extent; nitrogen also appeared to increase the virulence to apples of *B. cinerea* and *F. fructigenum* strain D. Advancing maturity diminished the resistance of the apples to *F. fructigenum* strain D, and of the potatoes to *F. coeruleum*; when fully ripe, the apples were rotted by the latter species and by the very weakly parasitic *F. fructigenum* Biii strain.

Experiments further showed that the failure of the normal parasites of the one host to attack the other was not due to any inhibiting effect of the juice of the latter on the germination of the spores, but rather to the deactivating action of the juice on the enzymes produced by the fungi. The active principle in the potato juice appeared to be its mineral content, more particularly magnesium and potassium phosphate, and that of the apple juice, the concentration of malic acid. The pectinase enzyme of the *Pythium* was found to have its greatest activity on the alkaline side of neutrality, and to be very sensitive to an acid reaction, the reverse being true of the enzyme of *B. cinerea*. Potato juice was also shown to render certain plant tissues, e.g., potato and turnip, more resistant to the action of *B. cinerea*.

Pasinetti (L.). **La patogenicità della 'toile' in rapporto all'azione dei raggi X.** [The pathogenicity of the 'toile' organism in relation to the action of X-rays.]—*Riv. Pat. Veg.*, xxii, 7–8, pp. 201–217, 1 pl., 1932.

Although exposure of the mycelium of the asporogenous strain of *Botrytis cinerea* shown by Beauverie to cause the well-known 'toile' disease [*R.A.M.*, x, p. 612] to the action of X-rays (3 MA., 100 KV., D.F. cm. 20, filterless) for five to thirty minutes failed to attenuate the virulence of the fungus as tested by laboratory inoculations on pea and bean [*Phaseolus vulgaris*] seedlings, it was noted that 24 hours after exposure for some 20 minutes the irradiated mycelium was growing much more actively than the unexposed, the difference between the two becoming progressively greater throughout a period of four or five days. The exposed hyphae were brighter, more branched, and usually wider

than the unexposed, and their cytoplasm showed smaller and more numerous granules. As the sclerotial stage was approached emptying of the hyphae was more frequent in the exposed mycelium. Forty-eight hours after exposure the mycelium began to yellow rapidly, and it reached the pre-sclerotial stage when the unexposed mycelium was only beginning to turn yellow. Cultures from transfers originally exposed for 10 to 30 minutes reached an equivalent stage of growth in 48 hours to that reached in 72 hours by transfers from unexposed cultures. With the fifth or sixth transfer the stimulation imparted by the rays became imperceptible. The exposures did not induce spore formation. Higher dosages and longer exposure rapidly arrested growth.

Pasinetti (L.). **Le variazioni micro-termo-elettriche in alcuni eumiceti patogeni delle piante irradiati con raggi X.** [The micro-thermo-electrical variations in certain Eumycetes pathogenic to plants after exposure to X-rays.]—*Riv. Pat. Veg.*, xxii, 7–8, pp. 219–264, 1 pl., 1 diag., 4 graphs, 1932.

When cultures of the asporogenous strain of *Botrytis cinerea* [see preceding abstract] were exposed for five to thirty minutes to the action of X-rays (3 MA., 100 K.V., 30 cm. D.F., filterless) and their temperature was afterwards measured at intervals of 24 hours (up to 168 hours) by a special thermo-electrical technique [which is described] it was found that the exposures brought about an increase in temperature closely associated with heightened cellular activity; intracellular combustion was increased and the vital processes of each cell-unit accelerated until it died or its vital activities became prematurely arrested.

Twenty-four hours after the exposures had been made, the average temperature of the unexposed controls was 0·2452° C. higher than that of the surrounding atmosphere, this figure rising to a maximum of 0·3668° 48 hours later and falling to 0·3156° after a further 96 hours. The corresponding figures for the cultures exposed for five minutes were 0·7545°, 0·9485°, and 0·432°, those for the ten-minutes' exposures showing a parallel rise and fall. Exposure for both these periods temporarily stimulated cellular activity without inducing any appreciable protoplasmic changes.

In the cultures exposed for 15 to 30 minutes the latency period was protracted up to about 24 hours after exposure. When this phase had passed, the physio-cellular and vital functions were strongly activated. In this latency period, 24 hours after the cultures had been exposed for 15 minutes, their temperature averaged only 0·258° higher than that of the surrounding atmosphere, while the corresponding figures for 48, 144, and 168 hours after exposure were, respectively, 0·5800° (0·3746° in the controls), 0·8420° (0·3542°), and 0·8330° (0·3156°).

When the exposures lasted for 20 minutes the latency period was shorter. Twenty-four hours after exposure for this period the average temperature of the cultures was 0·619° higher than that of the surrounding atmosphere, the corresponding figures after 48, 72, 96, 120, 144, and 168 hours being, respectively, 1·091°, 0·8565°, 1·004°, 0·645°, 1·031° and 0·9664°. The increase in cellular activity was greater in this series than in any other.

Exposure for 25 and 30 minutes caused somewhat similar effects to exposure for under 20 minutes, the thermal behaviour of the former being due to excessive, and that of the latter to insufficient exposure.

When a strain of *Pythium de Baryanum* was used a closely similar acceleration of thermogenesis took place, exposure for 20 minutes again giving the optimum results.

BRODIE (H. J.). **Oidial mycelia and the diploidization process in Coprinus lagopus.**—*Ann. of Botany*, xlvi, 184, pp. 727–732, 1932.

After a brief reference to a previous communication in which he described the structure and function of oidia borne on the haploid mycelia in *Coprinus lagopus* [*Ann. of Botany*, xlv, pp. 315–344, 1931], the author gives details of further experiments in which he established that oidial mycelia (i.e., derived from oidia) of opposite sex are able to diploidize one another, as shown by the formation of clamp-connexions. The same was also true of haploid mycelia of opposite sex derived from basidiospores (basidiosporous mycelia), and oidial mycelia of one sex were also diploidized by basidiosporous mycelia of the opposite sex. It was further shown that the oidial mycelium of *C. lagopus* grows indefinitely without producing haploid fruit bodies when not diploidized by a mycelium of the opposite sex.

VANDENDRIES (R.) & MARTENS (P.). **Oïdies haploïdes et diploïdes sur mycélium diploïde chez 'Pholiota aurivella' Batsch.** [Haploid and diploid oidia on a diploid mycelium in *Pholiota aurivella* Batsch.]—*Bull. Cl. Sci. Acad. Roy. de Belgique*, Sér. V, xviii, 5, pp. 468–472, 3 figs., 1932.

Cultures of *Pholiota aurivella*, in which bipolar heterothallism occurs, were found to bear numerous oidiophores on hyphae showing clamp-connexions and therefore belonging to the diploid mycelium. This is entirely contrary to the usual habit of the higher Basidiomycetes, which bear their uninuclear, haploid oidia on a primary thallus [see preceding abstract]. The diploid mycelium in *P. aurivella* produces three types of oidia, viz., cylindrical, concatenate, and binucleate; ovoid, single, and binucleate; and fusiform, single or in groups, becoming uninucleate by transverse division. The two first-named types immediately give rise to normal diploid mycelia, while the third may either liberate each cell separately as a haploid oidium giving a haploid mycelium or may revert to the diploid condition.

Tätigkeitsbericht des Kartoffelfachausschusses über das Jahr 1932. [Report on the work of the Committee of Potato Experts during the year 1932.]—*Neuheiten auf dem Geb. des Pflanzensch., 1932*, 5–6, pp. 101–108, 1932.

The following items of phytopathological interest (by [R.] Fischer and [H.] Neumann) occur in this report. A root rot of potatoes caused by *Rhizoctonia* [*Corticium solani*] was very prevalent in Austria during 1932. The younger leaves of affected

plants assumed a reddish tinge, wilting and rolling of the foliage ensued, and the stunted tubers were of a rubbery consistency. The rotted base of the plants usually displayed deep fissures and was often enveloped in the whitish mycelium of the fungus, associated with which were species of *Fusarium* and occasionally *Verticillium*. The trouble was apparently confined to regions in which the dry, hot weather of May and June was accompanied by heavy local showers, inducing the formation of cracks in the strongly suberized basal tissues. The optimum temperature for the development of the fungus (22° to 25° C.) was maintained for weeks at a time.

None of the preparations used in soil disinfection tests against the wart organism [*Synchytrium endobioticum*: *R.A.M.*, xi, p. 321] was at all effective with the exception of sulphur, which slightly reduced the incidence of infection.

Experiments in the reaction of 59 potato varieties to *Phytophthora* [*infestans*: ibid., xi, p. 71] showed that four escaped both leaf blight and tuber rot, nine were resistant to the former but susceptible to the latter, 18 contracted leaf blight but not tuber rot, while 28 were susceptible to both forms of the disease.

FOLSOM (D.). **Potato virus diseases in 1931.**—*Amer. Potato Journ.*, ix, 10, pp. 173–181, 1932.

A survey is given as in previous years [*R.A.M.*, x, p. 484] of recent American and European literature (1930-1) on virus diseases of potatoes (psyllid yellows [ibid., x, p. 65], mosaic of various types, masked and otherwise, spindle tuber and unmottled curly dwarf [ibid., x, p. 264], and leaf roll).

MUNCIE (J. H.). **Yellow dwarf and 'moron' diseases of Potato in Michigan.**—*Proc. Eighteenth Ann. Meeting Potato Assoc. America, 1931*, pp. 70–73. 1932. [Received January, 1933.]

In 1931 yellow dwarf of potatoes [*R.A.M.*, xi, p. 48] was observed in 134 fields in 19 counties of Michigan, as compared with 32 fields in 8 counties in 1929. In one field where 0·5 per cent. of infection was found in 1929 and none in 1930, 24 per cent. occurred in 1931. In another instance 50 per cent. of the plants were affected in 1931 as against only 0·1 per cent. in 1930. The difficulty of recognizing the primary stages of the disease may be largely responsible for its rapid spread. Thus, in 1930 about 6,000 seedlings were grown in the greenhouse and transplanted in June to a plot three-quarters of a mile from any other potatoes. Careful inspection failed to reveal any yellow dwarf in these plants during the growing season, and 97 hills were saved and planted in units in 1931 about a quarter of a mile from other potatoes [cf. ibid., xii, p. 50]. During early June 26 entire units, and in August five additional plants were rogued out for yellow dwarf. No evidence of soil infection has been obtained. Inoculation tests have resulted in a few cases in a slight brown flecking of the pith and cortex of the nodes at the tip of the shoots, one of the early symptoms of the disease, but the significance of this is not yet clear.

The so-called 'moron' disease is characterized by abnormally pale, later greyish-green foliage, pointing and sometimes slight rolling of the apical leaves, enlargement of the stem nodes, and shortening of the internodes. In the later stages the russet varieties assume an erect, bushy habit of growth, the stems turn reddish-purple, and the leaves show marked rolling near the tips. The pith and cortical tissues of the stems usually show distinct flecking near the base. One or more of the tubers may be flabby and they generally exhibit a brown discoloration of the cortical layer, often extending throughout the tuber. The trouble may be due to defective starch translocation. Careful roguing reduces the disease to a minimum.

MARTIN (W. H.). **Report of the Seed Potato Certification Committee.**—*Proc. Eighteenth Ann. Meeting Potato Assoc. America, 1931*, pp. 115–124, 1932. [Received January, 1933.]

During the autumn of 1931 the authorities in charge of seed potato certification in the various American States and Canada were asked whether they approved of the standards suggested the previous year [*R.A.M.*, x, p. 484]. In most cases affirmative replies were returned, but a number of suggestions [which are summarized] were made for modifications of the standards in various particulars.

BAILEY (H. L.). **Report of the Division of Seed Potato Certification.**—*Sixteenth Bienn. Rept. Vermont Commissioner of Agric. 1930–32*, pp. 80–85, 1932.

During 1930 virus diseases of potatoes, especially leaf roll, were prevalent in Vermont, and only 436 acres were certified out of 744 inspected. In 1931, however, conditions in this respect were much better, with the result that 92 per cent. of the 854 acres inspected were passed as fit for seed [cf. *R.A.M.*, x, p. 267]. This favourable outcome is attributed largely to the use of the best home-grown stock supplemented by highest grade Canadian (Prince Edward Island and New Brunswick) seed. Some details are given of the testing methods adopted.

SEVENSTER (A.). **Plants de Pomme de terre de Hollande.** [Seed Potatoes from Holland.]—*Journ. d'Agric. Prat.*, N.S., xcvi, 41, pp. 306–307, 1 fig., 1932.

As from 26th May, 1932, the two Dutch seed potato-testing organizations formerly known, respectively, as the Central Committee for Crop Control in the Netherlands (C.C.) and the Institute of Cereals and Seed Potatoes (K.I.Z.), have been merged in a single body, the General Service of Crop Control in the Netherlands ('Nederlandsche Algemeene Keuringsdienst' or N.A.K.) [cf *R.A.M.*, ix, p. 263]. By a Royal Decree of 3rd June, 1932, the export of seed potato tubers is permitted only under the supervision of this organization, which issues certificates giving information in different languages as to the grade of the consignment (A = excellent, B = good, and C = satisfactory), variety, dimensions of the tubers, kind of soil in which the crop was cultivated, and the like.

BOYSEN (H.). **Flatskurv—Actinomyces-skurv—og jordreaksjon. Noen iakttagelser fra Hvam forsøksgård.** [Flat scab—*Actinomyces* scab—and soil reaction. Some observations from the Hvam experimental farm.]—Reprinted from *Tidsskr. Norske Landbruk, 1932*, 10, 6 pp., 1932.

Details are given of the occurrence of potato scab (*Actinomyces* spp.) [*A. scabies* and related forms] on an experimental farm in Norway during the years 1925, 1926, 1927, and 1930. The soil was of a very poor sandy heathland type.

In 1925 the potatoes (Louis Botha) received 23 or 40 kg. per hect. of superphosphate or basic slag, a control plot being left untreated. The soil reaction fluctuated between P_H 4·1 and 4·4. The highest incidence of infection (48 per cent.) occurred on the plot receiving 20 kg. basic slag and the lowest (27 per cent.) on that to which 40 kg. superphosphate was applied. In 1926 there was 64 per cent. scab on a plot receiving 4,500 kg. lime and 300 cu. m. clay per hect., 49 per cent. on one receiving the same quantity of lime alone, 41 per cent. on that with clay alone, and 34 per cent. on an untreated plot. The hydrogen-ion concentration of the most severely infested areas was P_H 4·4 to 4·5. The highest incidence of scab (72 per cent.) in Sagerud potatoes in 1927 occurred on a plot given 80 kg. Dalen cement-potash-lime and 3,000 kg. lime per hect. in 1926, 70 per cent. being recorded on one receiving 80 kg. 40 per cent. potash and 3,000 kg. lime in 1926 and the same amount of the Dalen mixture yearly (soil reaction P_H 4·3 and 4·8, respectively). The scab percentages on the plots receiving 80 kg. 40 per cent. potash, the same with the Dalen mixture, the Dalen mixture alone, and no fertilizer were 36, 46, 42, and 27, respectively (reaction P_H 3·6 to 3·7). A further experiment was conducted in 1930 with clay and lime, using the moderately resistant King George V variety, the infection percentages being as follows: 35·9 on a plot given 5,000 kg. lime per hect. (P_H 6·08), 32·5 on one receiving 150 cu. m. clay and 5,000 kg. lime, 21·1 where 300 cu. m. clay was applied, and 13·7 on the control (P_H 3·65).

Meteorological records show that the rainfall in 1925 was below normal, in 1926 and 1927 much above normal, and in 1930 normal. The summers of 1925 and 1926 were warm, 1927 was cool, and 1930 normal.

The striking feature of these experiments is the occurrence of scab at the very acid soil reaction of P_H 3·6.

NEUWEILER (E.). **Der Kartoffelkrebs in der Schweiz.** [Potato wart in Switzerland.]—*Landw. Jahrb. der Schweiz*, xlvi, 5, pp. 680–688, 1 map, 1932.

Of the 25 centres of potato wart (*Synchytrium endobioticum*) infection detected in Switzerland from 1925 to 1930 [*R.A.M.*, xi, pp. 120, 468], covering a total area of 2 to 3 hect., 17 are directly or indirectly traceable to imported seed stocks, while the remainder may be attributed to soil infestation or other modes of dissemination. In 1931 the disease was found to have spread very considerably, being detected in 57 centres, mostly on seed stocks of the Alma variety imported from an East Prussian farm, though in

two localities the Kaiserkrone and Frühe Rosen varieties were also involved. The potato-exporting farm has for many years enjoyed a high reputation for the production of first-class seed stocks, and it is certain that the presence of infection among the tubers was quite unknown to the authorities, who had, moreover, sanctioned the distribution of large quantities of this seed throughout East Prussia. The infection was of a mild type but it spread extensively, assuming a more severe form in heavy soils, while the development of the fungus was also favoured by the damp season of 1931. The present distribution of the disease in Switzerland is shown by a map.

Drastic legislative measures have been enforced by the Swiss Federal and local agricultural bodies to prevent any further spread of the disease beyond the 38 hect. now infested. Crops from these fields are to be removed to special places of storage and either used for fodder (after acidification) or otherwise disposed of at the discretion of the officials in charge. All the plant refuse in the field must be collected and destroyed, and lime strewn over the soil at the rate of 20 kg. per are. For a number of years infested fields must be used for pasturage, after which they, together with any areas in which the presence of wart disease is suspected, are to be planted exclusively with immune varieties. Potatoes from suspected fields are to be used, as far as possible, for home consumption, or otherwise to be supplied to such centres as Zürich in which proper arrangements exist for the incineration of rubbish. Compensation is allowed at the rate of Fr. 8 per 100 kg. for unsorted requisitioned tubers and at Fr. 4 for those used for fodder on infected farms. Disinfectants, e.g., lime and formalin, are to be purchased on co-operative lines at the expense of the cantons, which in turn will be indemnified by the Federal departments concerned to the extent of 50 per cent. of the outlay.

Pending the entire reorganization of the Swiss potato industry through the use of immune varieties, the limited cultivation of the following commercially important susceptible sorts will be allowed during the transition period: (a) early: Frühe Rosen, Zwickauer frühe Gelbe; (b) medium-early: Alma (Millefleurs), Allerfrüheste Gelbe, Odenwälder Blaue, and Up-to-Date; (c) late table: Industrie, Centifolia; (d) late industrial: Wohltmann. Ultimately the following immune varieties will be used: (a) Rosafolia, Kuckuck, and Frühe Amerikaner; (b) Great Scot, King George, Weltwunder, and Erdgold; (c) Ackersegen, Jubel; (d) Parnassia.

REDDICK (D.), CROSIER (W. F.), & MILLS (W. R.). **Blight immune Potato hybrids.**—*Proc. Eighteenth Ann. Meeting Potato Assoc. America, 1931*, pp. 60–64, 1932. [Received January, 1933.]

Promising results have been obtained at Ithaca, New York, by hybridization experiments between the wild Mexican *Solanum demissum*, which is immune from potato blight (*Phytophthora infestans*) [*R.A.M.*, xi, p. 672] and the cultivated Smooth Rural variety. Although the number of plants involved is small, the records to date indicate that the immunity of *S. demissum* is carried over into the first and second hybrid generations and into

back crosses (using the Ekishirazu variety) [ibid., vii, p. 738] to a considerable extent.

Ziling (M. K.). Материалы к познанию микофлоры почв Зап. Сибири. Предварительные итоги работы **1931** г. [Contribution to the knowledge of the fungal flora of West Siberian soils. Preliminary results of the work done in 1931.]—ex *Болезни Зерновых Культур.* [*Diseases of cereal crops*], issued by *Siberian Scient. Res. Institute for Cereal Industry*, Omsk, pp. 40–61, 1932.

This is a detailed account of the preliminary results obtained in 1931 in the investigation, started in that year, of the fungal flora of soils under cereals and grass in the neighbourhood of Omsk, with particular reference to fungi of phytopathological interest. Species [mostly unspecified] belonging to 36 genera were recognized, of which representatives of *Penicillium*, *Fusarium*, Mucoraceae, *Cladosporium*, *Alternaria*, *Aspergillus*, and *Botrytis* were the most common and most numerous. No significant correlation has so far been observed between the various methods of cultivation of the soil and the numbers and composition of its fungal flora.

Special attention was given to the genus *Fusarium*, as being the most dangerous, under local conditions, to cereal crops, and an annotated list is given of 15 species or forms which were identified. The outstanding fact revealed by the investigation was the extensive occurrence in all the soils of the more pathogenic *Fusarium* spp., particularly *F. oxysporum* which was practically omnipresent. Continued cultivation of wheat for several years on the same land did not appear to increase the content of the soil in *Fusarium* spp., and, on the other hand, winter or spring bare fallow did not appear to reduce their numbers. Another striking fact was that the number of pathogenic species of *Fusarium* was considerably increased in soil put under grass, especially *Agropyrum tenerum*, for six years, as compared with soils under wheat. This fact throws considerable doubt on the value of grass for the regeneration of soil fertility.

Kubiena (W.). **Über Fruchtkörperbildung und engere Standortwahl von Pilzen in Bodenhohlräumen.** [On fruit body formation and the specific choice of habitat by fungi in soil cavities.]—*Arch. für Mikrobiol.*, iii, 4, pp. 507–542, 25 figs., 1 diag., 1932.

The writer's micro-analytical investigation of Austrian soils by an improved technique [which is described in detail] revealed the presence of fructifications of *Mucor racemosus*, *M. alternans*, *M.* sp., *Rhizopus nodosus* [*R.A.M.*, xi, p. 554], *Achlya gracilipes*, *Oedocephalum glomerulosum*, *Hyalopus crystallinus*, *Mycogone* sp. (?), *Sporotrichum* sp. (?), *Acladium* sp., *Coëmansia* sp., *Periconia* sp., *Cladosporium* sp., *Penicillium* sp., and *Actinomyces* sp. Notes are given on the types of soil in which these species were encountered, and Waksman's observation that the number and varieties of fungi increase with the improved cultivability of the soil was confirmed.

WEINDLING (R.). **Trichoderma lignorum as a parasite of other soil fungi.**—*Phytopath.*, xxii, 10, pp. 837–845, 4 figs., 1932.

Cultures of an extremely virulent, fast-growing strain of *Rhizoctonia* [*Corticium*] *solani*, as well as of *Phytophthora parasitica*, *Pythium* spp., *Sclerotium rolfsii*, and *Rhizopus* sp., all isolated from damped-off citrus seedlings in California, were parasitized by *Trichoderma lignorum* [*R.A.M.*, xi, p. 414]. The inhibition and death of the host fungus were caused either by close contact or coiling of the parasite round the aerial hyphae, or by the toxic action of the parasite at a short distance in the case of the submerged mycelium. *Pythium* spp. and *Phytophthora parasitica* seemed in general to be more readily overcome than *C. solani* by *T. lignorum*. The results of preliminary pot experiments indicate the possibility of the practical control of damping-off in citrus nurseries by abundant inoculation of the soil with cultures of *T. lignorum*, which is quite harmless to the seedlings.

MCRAE (W.). **Effect of mosaic on the tonnage and the juice of Sugar cane in Pusa, Part II.**—*Indian Journ. Agric. Sci.*, ii, 4, pp. 378–384, 1932.

Details are given of carefully controlled plot experiments at Pusa to determine the effect of mosaic on the tonnage and juice of sugar-cane [*R.A.M.*, xi, p. 425], the results of which showed that diseased Co. 213 was 11 per cent. less in germination after seven weeks, 14·8 per cent. less in yield of stripped cane, 8·9 per cent. lower in yield of juice, slightly less in brix, and 4 per cent. lower in sucrose than healthy cane.

VERWOERD (L.) & DU PLESSIS (S. J.). **Descriptions of some new species of South African fungi and of species not previously recorded from South Africa. IV.**—*S. African Journ. of Sci.*, xxix, pp. 313–316, 1932.

Among other new species of fungi and fresh records for South Africa [*R.A.M.*, xi, p. 267] the following may be mentioned. *Phoma fici caricae* n. sp. causes a fig canker at Stellenbosch. The subcuticular, depressed globose or semi-elliptical, pycnidia, measuring 106·5 to 227·2 by 99·4 to 191·7 μ, are situated in the greyish-white central portions of irregularly longitudinal branch cankers; the ostiole is circular to elliptical, depressed or occasionally slightly papillate, 5 to 10·2 by 3·4 to 9·5 μ; the peridium smooth, membranous, black, 8·5 to 15·3 μ thick; the pycnospores continuous, smooth, hyaline, elliptical to ovoid, muticate, 3 to 4·5 by 1·4 to 1·7 μ; and the conidiophores hyaline, simple, pointed, 2·6 to 3·4 by 1·2 to 1·5 μ.

On onion leaves irregular, grey spots, spreading from the top downwards, are formed by *Phyllosticta cepae* n. sp., the subepidermal, erumpent, globose pycnidia of which measure 64·6 to 110·5 μ in diameter, with a depressed, circular ostiole, 8·5 to 16·5 μ in diameter; the smooth, black peridium is 6·8 to 13·5 μ thick; the smooth, elliptical to semi-ovoid, hyaline, continuous, biguttulate, mostly muticate pycnospores measure 3·4 to 7·1 by 1·7 to 2·2 μ; and the conidiophores are short, hyaline, and simple.